SCIENTIFIC AMERICAN

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Spontaneous Combustion.

Mr. C. C. Hine, editor of the *Monitor*, relates the following: "The Institute of Technology, at Boston, long ago decided upon the danger of steam pipes passing through and in contact with wood. It was shown that the wood, by being constantly heated, assumes the condition, to a greater or less degree, of fine charcoal, a condition highly favorable to spontaneous combustion. Steam was generated in an ordinary boiler, and was conveyed therefrom in pipes which passed through a furnace, and thence into retorts for the purpose of distilling petroleum. Here the pipes formed extensive coils, and then passed out, terminating at a valve outside the building. To prevent the steam when blown off from disintegrating the mortar in an opposite wall, some boards were set up to receive the force of the discharge, and as often as the superheated steam was blown, the boards were set on fire."

THE GREAT TANGENT GALVANOMETER OF THE CORNELL UNIVERSITY.

The cut represents a standard galvanometer constructed at the Cornell University from designs of W. A. Anthony, Ph.B., Professor of Physics, to meet the want of a standard instrument for the measurement of heavy currents, and for the direct calibration of the commercial instruments in use for measuring the currents employed in electric lighting, etc.

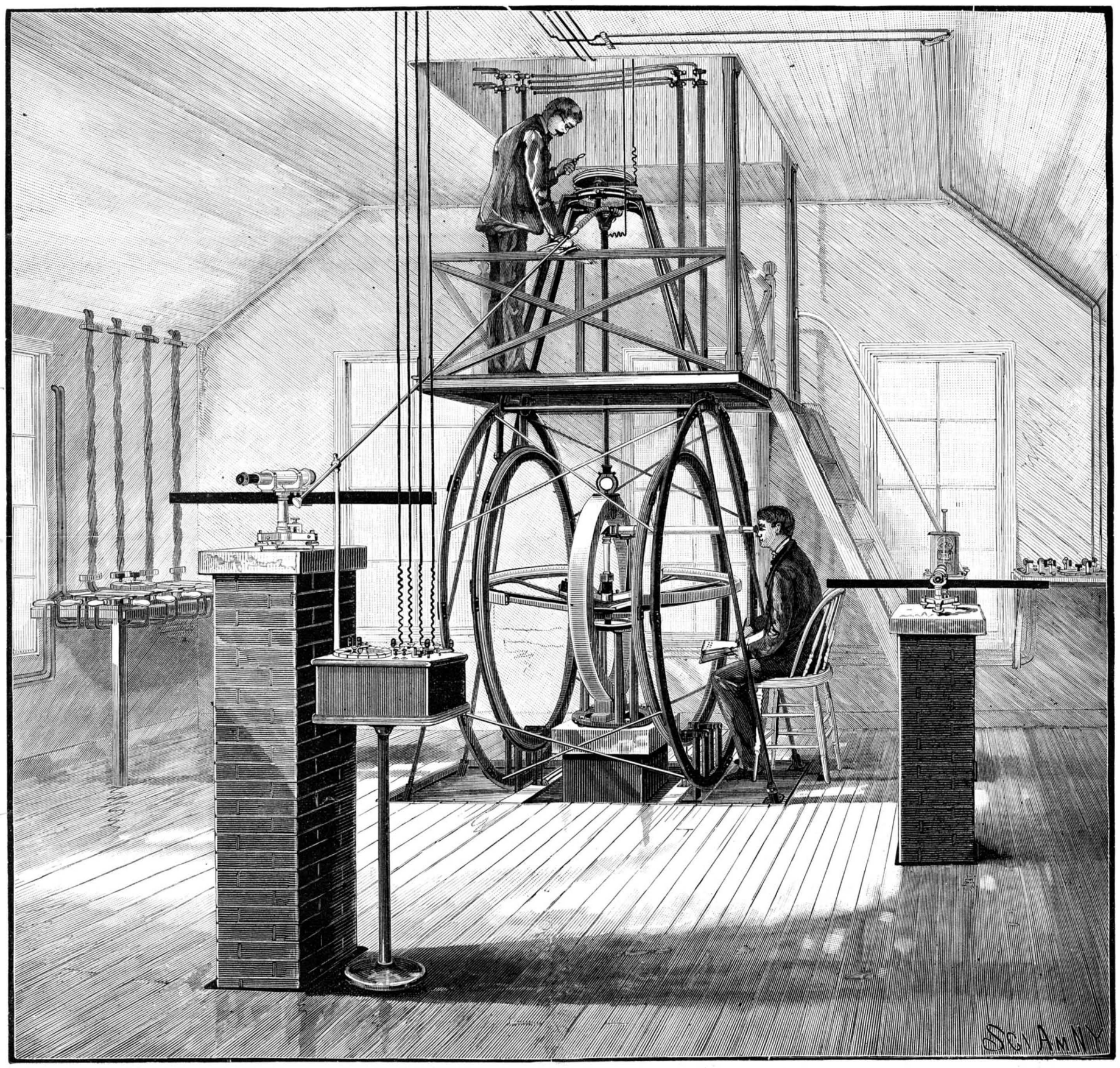
For the measurement of heavy currents there are four circles, two 2 meters in diameter and two 1·6 meters diameter, mounted according to Helmholtz's plan at distances apart equal to their radii. The conductors forming these circles are copper rods, three-fourths inch in diameter. The needle is suspended by a silk fiber in a mass of copper, which serves as a very effectual damper, and makes it possible to take readings very rapidly. By a peculiar arrangement of mirrors and telescope the deflections are read directly in angular measure on a circle 50 inches in diameter to within three-tenths of a minute of arc. The copper conductors are mounted on a brass framework accurately turned and adjusted, and the dimensions are all known within one five-thousandth.

For the measurement of small currents there are two circles, about 1·5 meters diameter, each having two conductors, and comprising altogether 72 turns of No. 12 copper wire.

The indications of such an instrument, of course, depend upon the value of the horizontal intensity of the earth's magnetism, and without some means of determining this quantity in the place where the instrument stands, and at the time when a measurement is being made, no great accuracy is attainable.

For making this determination a coil, 1 meter in di-

(*Continued on page* 182.)



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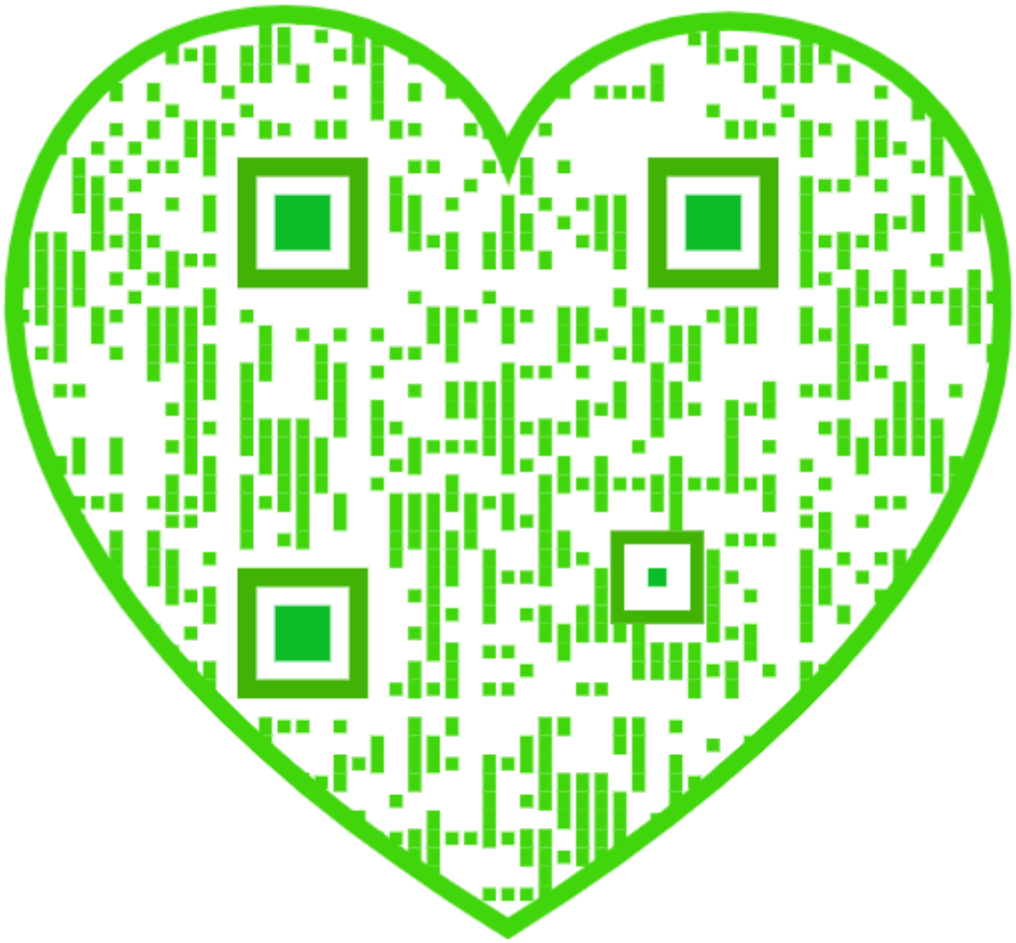

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NEW YORK, SATURDAY, SEPTEMBER 19, 1885.

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CYLINDRICAL NUTS.

The substitution of cylindrical nuts for those of a square or a hexagonal form has been advocated, with very good reasons as a backing. Recently an opportunity was given to see a practical illustration. A machinist had an order for a small ornamental steam engine, to be placed in the show window of a coffee and spice establishment, and on it he used cylindrical nuts instead of hexagonal ones. The engine was a horizontal one, with steam chest on the top of the cylinder, and all the hold-down bolts were furnished with cylindrical nuts, through the tops of which protruded the flattened convex ends of the bolts, making a very neat finish. The bolts were three-eighths of an inch diameter and the nuts three-quarters of an inch diameter; to have made them hexagonal they would have been a trifle over seven-eighths of an inch from corner to corner, and if square they would have been a full inch across corners, and neither the hexagonal nor the square nut would be any stronger than the cylindrical nut—the protruding corners give no additional strength. For a wrench he took a tool with opening jaws operated like a pair of pliers. These jaws, while slightly open, were reamed to fit the diameter of the nut, so that when closed on the nut the jaws would embrace almost its entire circumference; the leverage of the handles made a very slight pressure necessary to set up the nuts. The wrench did not have a short biting jaw, like a pair of pipe tongs, which dig into the pipe at each grip, but the inside of the jaws were perfectly smooth, and left no mark on the nut in using.

The method of making the nuts produced them in a very rapid manner. A bar of steel, of the proper diameter to finish to size after being turned, was fed through the head of a turret lathe, the end squared, a hole drilled in it, the tap run in, the surface turned, and the nut cut off; all done by fixed tools in the turret and the cross cutting off tool. The finished nut dropped, and the bar was advanced for another nut. There was no planing, milling, or seating on an arbor, as would be the case in forming and finishing rectangular nuts. Every machinist knows that lathe work is cheaper and quicker than reciprocating work, whether planer or milling machine.

In addition to these advantages of quick work, almost self-acting, the rapid production of the nuts and their finish from the first inception, there is the advantage of the requirement of less metal for the requisite strength. The embracing jaws of the wrench have a bearing on almost the entire circumference, while on the square and hexagon nuts the bearing of the wrench is on only two opposite sides.

Another advantage that the cylindrical nut has over the angular nut is that the wrench may get a grip in moving through the smallest arc of a circle; an advantage that will be understood by the setters-up of machinery under difficulties. With the square nut an entire quarter turn is required before, in a confined space, the wrench can get a new hold; and with the hexagonal nut not less than one-sixth of a revolution is necessary before the wrench can take a fresh grip. When the wrench handle is long and the working place is limited, these considerations are of consequence.

RAILWAY IMPROVEMENTS NEEDED.

The recent disaster near St. Catherines, Ontario, where a heavy passenger train drawn by two locomotives went through a swing bridge into the canal, brings to mind the fact that a similar accident occurred at the same place eleven years ago, and that about 1854 one of the most serious disasters on record occurred under similar circumstances near there on the same road at a canal bridge that has since been removed or abandoned.

There are appliances that will, if kept in working order, effectually prevent such accidents. It is true that accidents do happen occasionally on roads that are equipped with the most approved means of safety, but this is chargeable to the neglect of those who have the care of the appliances, rather than to any inherent defect. The liability of switch and drawbridge signals to become inoperative seems to be the principal reason set forth by railway officials for refusing to adopt them, and this objection may be removed by a more simple construction, which would render them reliable and proof against derangement. Simplifying their construction would also reduce the cost and remove the only remaining objection to their general adoption. Most of the signal devices brought forward of late are expensive, and require much skill and constant watching. An automatic signal that is not reliable at all times is more dangerous than those which are operated independently by an attendant, because greater reliance is placed upon the former, and it is not as closely watched by engineers. The recent accident occurred at midday, but the engineer had no warning of danger until he saw the ends of the rails at the pier, when he promptly moved the lever to apply the air brakes, but they failed to act. He then called for hand brakes, but it was too late. The primary cause of the accident was the lack of a proper signal, and the immediate cause was the failure of the brakes to operate. This is the fifth train that has met destruction on this side of the Atlantic within two years from failure of air brakes, and accidents less serious are frequent from the same cause. Doubtless the bridge would have been provided with an automatic signal were it not for an occasional failure of these appliances, and their excessive cost, and it would not seem a difficult matter to remove these objections.

Air brakes are usually placed under the care of skillful mechanics, whose business is to give them thorough inspection and all needed repairs at the end and before the commencement of each trip, but notwithstanding these precautions they sometimes refuse to act, and the results are usually serious. Brakes and signals that are more simple in construction, and require less skill and expense to keep in working order, are in demand.

AS TO THE SINKING OF THE WIRES.

The time given to the electrical companies in New York city to present plans and come to an agreement as to the system to be adopted in burying the wires has now gone by, and, according to the law passed by the last legislature, they must accept the plan chosen by the Electrical Subway Commission, or have their wires buried by it *vi et armis*.

Unhappily for the New York companies, the commission contains neither an electrician nor a scientific expert, and however good their judgment may be, it is scarcely probable that they will be able to discover a means of efficiently working long lines of telephone, at least, underground, when a score of experts employed by the companies have failed in a similar search.

It is pretty evident, too, by recent action of some of the companies, that the constitutionality of the law is to be thoroughly tested before they succumb; the Commission in the mean time being enjoined from interference. From reports which have reached us, the grounds on which an injunction will be asked may thus be summarized:

Having once had authority to string the wires through the streets, and there having been no proviso to restrain them at any moment from further operation of aerial lines, they cannot be constitutionally forced to change the mode of operation without compensation. The right of the legislature to forbid any further stringing of wires, save what is required to keep the original lines in efficient working, is admitted. But to compel the companies to make the great outlay required in taking their wires down and placing them underground would be to mulct them in damages for doing what under their charters they have a clear right to do, and it was intended they should be protected in doing. The case of the elevated railroads might be cited as in many ways parallel. Having legislative authority to build the road the incorporators went to the expense of construction. They took a certain risk. Had the project proved a failure, they would have had to stand the loss—the State, of course, would not have compensated them. Now, the project having proved a success, can the legislature step in and regulate the rates at which they are to carry passengers? Eminent authority decided that it could not, and the Governor refused to sign the bill.

How conclusive this reasoning may be, the writer has no intention of trying to determine. There is reason, however, to believe that the courts will be called upon to do so.

SHOP INDEPENDENCE.

Unless one has an "independent fortune," one making him independent of financial circumstances, there is no condition in civilized life preferable to that of a shop mechanic. Especially is this the fact if the mechanic is competent and feels an interest in his work. He has a comfortable shop, pleasant fellow workmen, good tools, and a job that will amount to something when it is done; this is enough to content a man who has a pleasant home or a comfortable boarding place. And yet there are some who look upon shop life as irksome and perfunctory.

There are others who do not. An illustration is recent. A fine workman, a machinist, possessing other valuable qualifications as an executive manager, a public speaker, and with great personal power of persuasion, was induced to take the superintendency and management of a Young Men's Christian Association. He filled the position satisfactorily and creditably; but at last he tired and resigned. Strong influences were brought to induce him to change his determination. He refused, and for nearly two years has worked in the shop as a tool maker. He gets good pay, but refuses to be a boss—only an inspector—and works every day as any ordinary workman.

Recently he was seen, and asked if the change from a public life to a shop life was agreeable. He was quite enthusiastic in his praise of shop life; he was independent; had no meddling suggestors to bother him; could scan his day's work in the morning, and see it done in the evening; was nobody's slave or servitor; did not have to modify his plans to suit a committee; his eight

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or ten hours per day was his absolute limit of work; and all the remainder was absolutely and really his and his family's. This is the sort of mechanic that recommends shop life, and proves that it is one of the most independent that a sensible man can follow.

DEATH VALLEY.

The name is fearfully suggestive, and yet few places in the world deserve their appellations so well as does the Death Valley of California, nor is it easy to find any other locality in any country whatever which gathers about itself so much that inspires horror and dread. A region where a man can die of thirst while he has water within his reach, more than he can drink, may well bear the most terrible title that can be given it; and this name—Death Valley—given from the first known event in its history, thirty-five years ago, will doubtless cling to the spot to the end of time.

It is in the southeastern part of Inyo Co., Cal., and the point at which the meridian of 116° 45′ W. crosses 36° 10′ N. is as nearly as possible in its center of horrors. Probably only one other spot of which we have any knowledge, the Guevo Upas, or Vale of Poison, in Java, exceeds the fatality of Death Valley.

The valley itself is 40 miles by 8, running nearly north and south, and every portion of this is desert and barren in the extreme, as is in fact the entire surrounding country; but a narrow central space along the eastern side, about fifteen miles in length, embodies the typical features in their highest intensity. Into this, not *Porte d'enfer*, but *Puit d'enfer*, very few persons have ever gone, that is, who returned to tell the tale, and what is here related pertains to the higher and comparatively moderate parts toward the borders of the valley.

The dangers are the result of atmospheric conditions solely. Lack of water may be a fatal evil, but this can be avoided; supplies of water may be carried, or better still, it is now tolerably well ascertained that water is available by sinking even shallow wells in much the greater extent of the upper portions of the valley.

But the water fails to afford its usual life-giving value from two causes. The first of these is the *heat.* Of course this is moderated during two or three of the winter months, and for that space of time a residence on the borders of Death Valley is possible without any exceeding great risk. But this soon passes away, and the furnace is in blast. By about April the average (of day and night) is from 90° to 95°; by May it is 95° to 100°; and a little later it averages over 100°, reaching often 120° to 125° in the coolest place that can be found. If this was with a damp atmosphere it would stifle any human life with great rapidity, but a certain amount of dryness enables it to be borne with more safety. Here, however, comes in the second of the two evils which have been indicated; the *intense dryness* of the atmosphere. This is so excessive as to be in many instances fatal, in spite of every precaution. The writer has never tested the full severity of this feature in Death Valley itself, but his experience along its immediate border renders him ready to give full credence to the statement that many cases of death have occurred "when water was plenty, but could not be drunk fast enough to supply the drain caused by the desiccative power of the dry, hot air." In fact, in one instance he himself nearly reached that condition, and a few hours longer of the heat and dryness would have placed his own name among those of its victims.

It has been said that birds drop dead in attempting to cross the valley. Mr. Hawkins, who visited it in 1882, says that he "picked up, at different times, two little birds, a mile or so from water, whose bodies were still warm, having evidently but just dropped dead." The bodies of men and their horses are liable to be encountered at any time; they have been found within a mile of water, and in one case with water still in their canteens, and a supply of food as well, showing that the climate was the cause of death. With these facts in view, it is not unreasonable to say that the name Death Valley is well bestowed. And if this is the state of things on the elevated borders, ranging from 1,200 to 2,000 feet and more above the sea, what must be the heat and the dryness in the very *focus?* For one of the additional wonders of Death Valley is that its central region lies away below the level of the sea. There is perhaps no other spot on the globe which at so great a distance from the ocean reaches such a depression—159 feet. The Dead Sea, with the gorges of the Jordan and the Arabah, of course greatly exceeds this, but it is not widely separated from the eastern parallel border of the Mediterranean.

The climatic violence of this deep trough of Death Valley must be left to conjecture. It is certain that no man could survive there long enough to secure continuous observations of any extent.

AN Association for the Protection of Plants has been started at Geneva. The object is to preserve Alpine rarities from the extermination with which the annually increasing number of botanists, mercenary collectors, and mountaineering tourists generally is said to menace them.

The Great Yacht Race.

The international contest between the fastest pleasure sailing craft of Great Britain and the United States, which was to have been completed during the week commencing September 7, was interrupted by a most unlucky accident, necessitating delay. The conditions of the race made it necessary that the yachts should go over the course of forty miles in seven hours, and on the first appointed day there was not sufficient wind for this purpose. The Puritan and the Genesta made the trial, but did not either of them reach the stake-boat, the wind being so light that it seemed rather a drifting than a sailing match. The next day, September 8, was then appointed for the first race. On this occasion the wind was good enough to promise a spirited contest, but, in taking position to cross the starting line, the Puritan crossed the course of the Genesta, with the result of disabling both yachts, the former's mainsail being torn and the latter losing her jib-boom. The judges decided it the fault of the Puritan, and, ruling her out, offered the Genesta the privilege of going over the course. This her owner declined, saying they had come over for a race and not for a "walkover," the occurrence having been undoubtedly entirely accidental, though indicating extreme sharp work by the sailing masters.

To give time for necessary repairs, the first race was set down for Friday, Sept. 11, the second one for Sept. 14, and the third, if it should be necessary, to take place on Sept. 16. The Genesta's owners found no difficulty in getting quickly fitted out in New York yards with a new jib of Georgia pine, while the Puritan's sails were as quickly mended, to make both yachts ready for the race on the 11th inst., which, like the first day's attempt, was a failure, the wind being too light for the yachts to go over the course in the required time of seven hours, although both crews exhibited fine seamanship for several hours in their attempts to get ahead of each other.

The "sailing measurement" of the two yachts, as made out by the official measurer of the New York Yacht Club, was as follows: Genesta, perpendicular, from topmast head to deck, 97·2 feet; base, from end of boom to tip of bowsprit, 140·5 feet, gaff, 46 feet; water line, 81·6 feet. Puritan: perpendicular, 102·01 feet; base, 144·6 feet; gaff, 47 feet; water line, 81·1 feet. This measurement made the sailing length of the Genesta 83·05 feet, and that of the Puritan 83·85 feet, so that the latter had to give the Genesta a time allowance in the race of 31 seconds.

History of the Tomato.

In an article upon "Kitchen Garden Esculents of American Origin," in the *American Naturalist*, Dr. E. L. Sturtevant has some interesting remarks upon the tomato, from which we make the following extracts:

"Tomatoes were eaten by the Nahua tribes, and were called (singly) *tomatl* (plural *tomamæ*)." The tomato "was described by various European botanists of the sixteenth century." . . . It seems to have been grown in European gardens as a fruit, from its first introduction, judging from the references in Dodonæus and Gerard; but Parkinson, 1656, speaks of it as grown in England for ornament and curiosity only. In Italy, Chateauvieux, 1812, mentions its cultivation on a large scale for the Naples and Rome market. It is probable that its use was at first more general among southern nations, as we find that the Anglo-Saxon race was the last to receive it into the kitchen garden. Thus, in 1774, Long describes the fruit well, and mentions its frequent use in soups and sauces, and adds that it is likewise fried and served up with eggs. In 1778 Marre and Abercrombie mention five varieties as known, two of which are described as scentless and burnet-leaved, and add that they are eaten by the Spaniards and Portuguese in particular, and are in high esteem.

"In the United States its introduction preceded by many years its use as we at present know it. It is said to have reached Philadelphia from St. Domingo in 1798, but not to have been sold in the markets until 1829. It was used as an article of food in New Orleans in 1812. The first notice of it in American gardens was apparently by Jefferson, who notes it in Virginia gardens in 1781. It was introduced into Salem, Mass., about 1802, by an Italian, but he found it difficult to persuade people even to taste the fruit. Among American writers on gardening, McMahon, 1806, mentions the tomato, but no varieties, as 'in much esteem for culinary purposes;' Gardiner and Hepburn, 1818, say, 'Make excellent pickles;' Fessenden, 1828, quotes from Loudon only; Bridgeman, 1832, says, 'Much cultivated for its fruits in soups and sauces.' They were first grown in western New York in 1825, the seed from Virginia, and in 1830 were not produced by the vegetable gardeners about Albany; yet directions for cultivating this fruit appeared in Thorburn's Gardeners' Kalendar, 2d edit., New York, 1817. Buist writes that as an esculent plant in 1828–29 the tomato was almost detested, yet in ten years more every variety of pill and panacea was 'extract of tomato.' Mr. T. S. Gold, Secretary of the Connecticut Board of Agriculture, writes me that 'we raised our first tomatoes about 1832, only as a curiosity, made no use of them, though we had heard that the French ate them. They were called love apples.' D. J. Browne, 1834, describes six varieties, and says: 'The tomato until within the last twenty years was almost wholly unknown in this country as an esculent vegetable.' In 1835 they were sold by the dozen in Quincy Market, Boston. In the *Maine Farmer*, October 16, 1835, in an editorial on tomatoes, they are said to be cultivated in gardens in Maine, and to be 'a useful article of diet, and should be found on every man's table.' In a local lecture in one of the Western colleges about this time, a Dr. Bennett refers to the tomato or Jerusalem apple as being found in the markets in great abundance, and in the *New York Farmer* of this period one person is mentioned as having planted a large quantity for the purpose of making sauce. In 1844 the tomato was now acquiring that popularity which makes it so indispensable at present, writes R. Manning." From this it appears that "the esculent use of the tomato in America does not antedate the present century, and only became general about 1835 to 1840."

No Right to Steal Away Your Employer's Business.

In Van Wyck *vs.* Horowitz, New York Supreme Court, special term, 28 Daily Reg., 305, the question as to the right of a party to use another name upon his business cards, etc., by saying "late with," etc., is discussed. In this case the defendant, who had been employed by plaintiff as a workman upon jewelry and in the repair of watches, set up in a business similar to that kept by plaintiff, and put upon his cards and upon a sign in his store "Late with James P. Van Wyck." This use of his name the plaintiff sought to restrain, and the court granted a motion to continue an injunction, saying: The statement of the case evokes instant condemnation from the hearer, and an analysis of the thoughts which produce such instantaneous conclusions will show that it rests upon sound legal principles as well as upon the conscience of the hearer.

The defendant has no right of property in the name nor in the reputation of that business which he seeks to use with his own name and business so as to give his own prominence at the expense of the other If the defendant had been a stove blackener, or hostler, or an errand boy in the employ of the plaintiff, or a clerk discharged for want of fidelity or competency, he could with just as much truth advertise himself as "late with James P. Van Wyck." The extreme supposed cases are put to illustrate the danger of the counsel's position. It cannot be that a man who has sustained any position toward or had any employment for a well known individual, that thereby he obtains the right to use that name in connection with his own, so as to advertise himself and his business at the expense of his former patron and employer, and to do it in a manner which is likely to, and often must, deceive as to the nature of the relations to him.

The motion to continue the injunction must be granted, because—

First. The defendant is, without authority, using the plaintiff's name, which is the use of another's property for his own benefit and to the injury of its owner.

Second. He is attempting to transfer to himself a part of the reputation of the store and business of the plaintiff, which also belong to the plaintiff as really and as truly as his name or his personal property of which he is the actual owner.

Third. The mode and manner of the use by the defendant of the name of the plaintiff are such as oftentimes to deceive, and because liable to deceive, and thus benefit the defendant at the expense of the plaintiff, such use must be held to be unlawful.

Value of the Arc Light.

Says the *Journal of Gas Lighting:* Sir James Douglass and many other disinterested observers of the course of events have for some time recalled electricians to a sense of the blunder they commit in devoting so much attention to the incandescent lamp and neglecting the arc light. It is notorious that the end and aim of incandescent lighting was simply to supersede gas. The extent to which this result is likely to be achieved is now pretty well understood. Electricians themselves are willing to admit that they cannot compete by means of incandescent lamps with gas at its present cost. The arc light, on the other hand, is susceptible of application for many purposes at a marked economy as compared with gas; and it is undoubtedly suitable for use in many places where gas cannot be obtained.

The older arc lamps brought themselves into disfavor by their unsteadiness; but this has, to a great extent, been remedied by improvements in the carbons, and by not expecting too much light from the power available. Arc lamps are still rather more liable to sudden extinctions than are incandescent lamps; and this failing will always cause them to be distrusted for street lighting and the illumination of large buildings frequented by the general public. On the whole, however, the field for profitable arc lighting is wider and more promising than that remaining for incandescent lighting. For many purposes there is no comparison between the arc and any other kind of artificial light.

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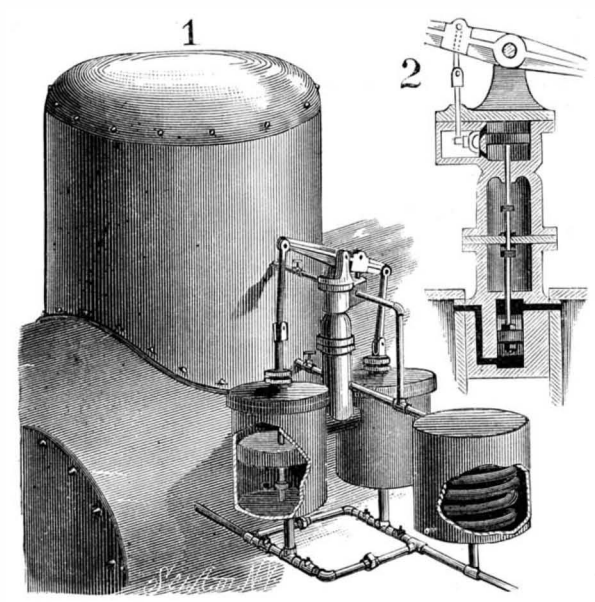
IMPROVED BOILER FEEDER.

The engraving illustrates an invention that relates to the use of water cylinders which are alternately filled and their contents run into the boiler in succession. The two vertical water cylinders shown in Fig. 1 are placed contiguously in any convenient position, with their bottoms slightly below the water level of the boiler. In each cylinder is a substantially made float placed loosely upon rods stepped in the lower ends of the cylinders, and extended through stuffing glands in the upper heads up to links connected with the ends of a pivoted beam. Between the cylinders is a steam chest (Fig. 2), fed from the boiler, and containing a slide valve moving on a seat having two steam ports leading to the cylinders and an exhaust opening leading to the condenser. Above the steam chest is a steam cylinder whose piston rod extends downward and connects with the valve in the chest. Steam is admitted to the cylinder by a valve actuated by a rod connected with the beam. The movement of the piston rod is limited by collars which come in contact with rubber buffers on a guide bar, as shown in the sectional view. The water cylinders have each a pipe connected in their lower heads for inlet of water from an elevated supply, and also for outlet of water to the boiler.



HAIGH'S IMPROVED BOILER FEEDER.

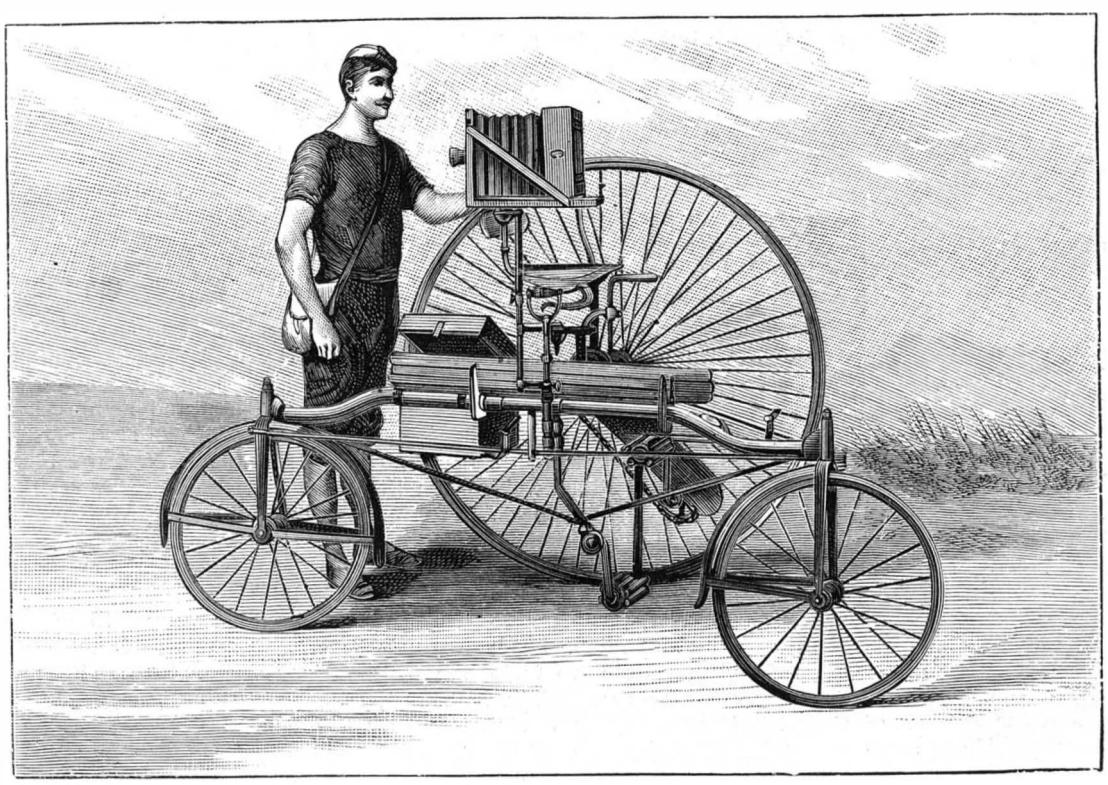
A stop cock in the pipe from the feed tank being opened, the water fills the cylinder that is not open to the boiler, the other cylinder being already filled. As the water level in the boiler lowers, the water in the cylinder open to the boiler by one of the ports will be gradually run out until the float, falling, comes in contact with a collar on its rod, which is moved down, the beam being thus moved to shift the upper valve to admit steam to its cylinder; the valve connected with the piston rod is shifted to close one port and to open the other, to admit steam into the filled water cylinder, which will empty as soon as the pressure has equalized. The steam in the cylinder just emptied now exhausts into the condenser, and the vacuum created starts the flow of water, so that it again refills. This operation is repeated so long as the water supply continues. This invention has been patented by Mr. Samuel Haigh, of Coquitlam, New Westminster, British Columbia, Canada.

Strophanthin, the New Diuretic.

Professor Fraser's paper on Strophanthus hispidus, read in the section of Pharmacology and Therapeutics, at the meeting of the Association at Cardiff, places us in the possession of a new and valuable heart remedy and diuretic. It appears that the drug is extensively used in many parts of Africa as an arrow poison. In the Mangauga district, near the Zambesi, it is called "kombe," while in Senegambia and Guinea the name "inee" is more commonly employed. Dr. Livingstone, in his "Narrative of an Expedition to the Zambesi," refers to this poison, and says the arrows are usually made in two parts. "An iron barb is firmly fastened to one end of a small wand of wood, ten inches or a foot long, the other end of which, fined down to a long point, is nicely fitted, though not otherwise secured, in the hollow of the reed which forms the arrow shaft. The wood immediately below the iron head is smeared with the poison. When the arrow is shot into an animal, the reed either falls to the ground at once, or is very soon brushed off by the bushes, but the iron barb and poisoned upper part of the wood remain in the wound. If made in one piece, the arrow would often be torn out, head and all, by the long shaft catching in the underwood, and striking against trees." The plant which yields the poison belongs to the Apocynaceæ, and has been described and figured by Professor Oliver, of Kew, under the name of Strophanthus Kombe. It is a woody climber, and flowers in October and November. The follicles vary in length from 10 to 12 inches, and contain from 150 to 200 seeds, each weighing about half a grain, and bearing a beautiful plumose tuft, placed at the extremity of a delicate stalk. They contain no alkaloid, but are rich in an active principle, which Dr. Fraser calls "strophanthin." This is a crystalline substance of intense activity, which seems destined to play an active part in our list of heart remedies. In physiological action it is allied to digitalin and other members of the digitalis group. It has been used, both experimentally on animals and clinically in the wards, at the infirmary at Edinburgh. The dose for hypodermic use is from 1-120 to 1-60 of a grain. In the discussion which followed the reading of Dr. Fraser's paper, Dr. Murrell pointed out that the introduction of strophanthin would serve to commemorate, in a way which would otherwise be impossible, the centenary of the publication of Withering's classical work on "The Foxglove and Some of Its Medical Uses."—*British Medical Journal.*

A PHOTO-TRICYCLE.

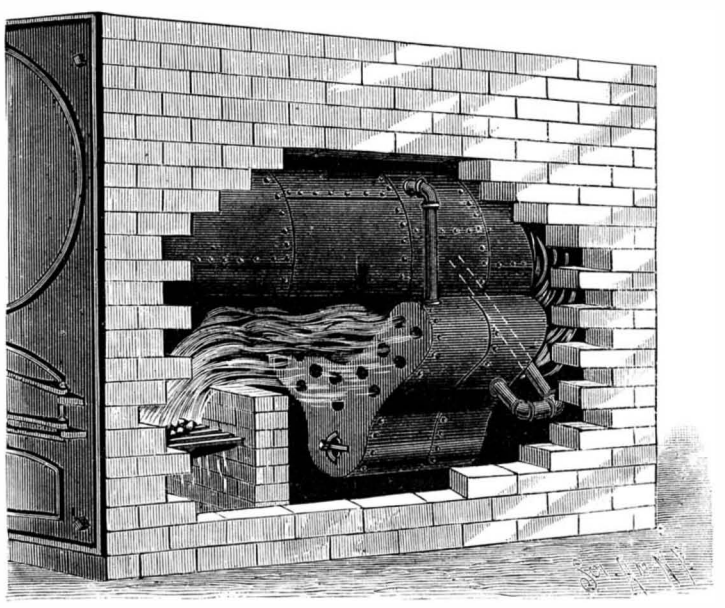
Velocipede riding is now much indulged in, especially in England, where the tricycle is an object of both utility and pleasure. The improvement that we shall herewith make known relates more particularly to the pleasurable side of the exercise. How many times has it not happened that the excursionist has regretted his inability to fix the landscapes and curious scenes that were unveiling themselves to his eyes? What was impossible with the slow and complicated processes of dry and wet collodion has now become a simple thing, thanks to gelatino-bromide. It was necessary, however, to give a form to the alliance of the new photographic processes with locomotion, and so Messrs. Rudge & Co. have brought out the photo-tricycle which we illustrate herewith, and which they style the "Coventry Rotary." The camera is mounted upon a universal joint that allows it to assume any position and take in the subject to be reproduced, in a few instants. Three boxes, each containing six plates, 6½ x 4¾ inches, are within reach of the hand, and can be quickly substituted for each other in measure as they are needed. The photographic apparatus may be either left upon the tricycle itself or be placed upon a tripod when the best point of view is not otherwise accessible. This is an innovation that will be highly appreciated by amateurs who cultivate both the arts of tricycling and photography, and this is why we make known to our readers a combination which is of a nature to render them some service.—*La Nature.*



PHOTOGRAPHIC TRICYCLE.

IMPROVED STEAM BOILER.

The accompanying engraving represents an improved steam boiler—the invention of Mr. George Fox, of 509 West 34th St., New York city—that effects economy in fuel by means of a supplementary boiler placed in the fire-box, and suitably connected by pipes with the main boiler. This is fitted in the furnace, which is preferably of the reverberatory kind, in the ordinary way, and beneath it is placed the supplementary boiler, made concave in form with a downwardly projecting pocket, and provided with fire tubes through which the flames from the fuel pass for heating the water in the boiler. The pocket is to receive any sediment that may be deposited in the supplementary boiler, a hand hole at one end permitting cleaning. Water is supplied to the supplementary boiler from the main one through inlet pipes, which pass from the lower part of the main boiler down below the other, which they enter at the bottom, so that the water will be considerably heated in the pipes. Return pipes entering the main boiler above the water line conduct the water back from the lower boiler. A space is left between the two boilers, through which the heat can pass. The lower part of the supplementary boiler is at the point of intensest heat in the furnace, thus utilizing the maximum amount of heat. When the boilers are filled with water and the fire started, a continuous flow will take place from the main boiler to and from the supplementary boiler.



FOX'S IMPROVED STEAM BOILER.

A Hurricane at Charleston, S. C.

A storm of wind and rain which probably has not had its equal in the same section in a hundred years past, broke over our southeast Atlantic coast at daylight on the morning of Aug. 25. It was most severely felt at Charleston, S. C., but did considerable damage also at Savannah, Ga., and Jacksonville, Fla. At 7 o'clock in the morning the apparatus in the roof of the signal office at Charleston was demolished, and the last observation then denoted a wind of 68 miles an hour. The storm did not, however, reach its height until about 9 o'clock, when, from the additional destruction it had caused, it was estimated that the wind had attained a velocity of 75 to 80 miles an hour.

The latter pressure is styled in aerodynamics a hurricane, with a 100 mile an hour rate as a cyclone. The wind pressure per square foot, when blowing at 70 miles an hour, is 24·1 lb.; at 75 miles, it is 27·7 lb.; and at 80 miles it is 31·49 lb.; so that it is easy to compute the force that was exerted in tearing down buildings, destroying wharfs, etc., the ground in many places having been described as cleaned off as though its structures had been sheared off by a razor. The damage at Charleston is computed at over one million dollars.

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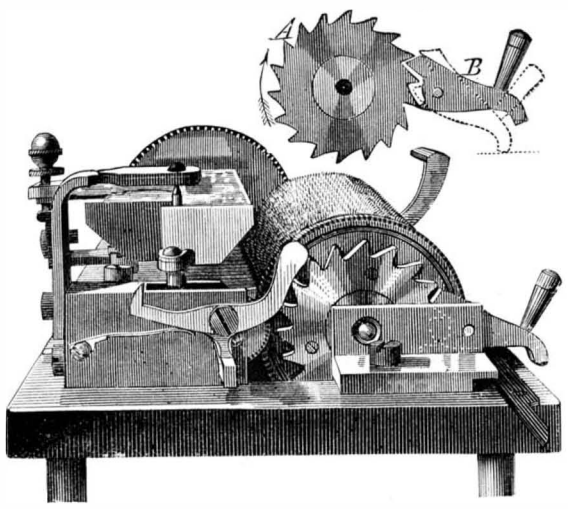
SAFETY CHECK FOR MUSICAL BOXES.

Musical boxes are operated by one or more more powerful springs, the speed being controlled and regulated by a series of wheels and pinions connected with a fly wheel. Now if the fly wheel be broken or removed, or any of the wheels get loose from the pinion when the spring is wound, the cylinder will revolve with lightning rapidity, and bend or break the pins on the cylinder as well as the teeth of the comb in such a manner as to ruin the instrument forever. In order to prevent such accidents (which occur almost daily), Mr. C. H. Jacot, of the firm of Jacot, Juillerat & Co., 37 Maiden Lane, New York city, has invented an attachment,



JACOT'S SAFETY CHECK FOR MUSICAL BOXES.

herewith illustrated, by which these accidents will be impossible, for as soon as the cylinder revolves too fast a pawl will engage in the ratchet wheel and hold it firmly. The action of the pawl is positive, and it has no chance to fail in working.

Secured rigidly to one end of the shaft of the cylinder is a ratchet wheel, A, formed as clearly shown in the engraving. Pivoted so as to engage with the teeth of this wheel is a pawl, B, having a weighted outer end; the upper part of the inner end of the pawl is formed to fit the recesses of the teeth, and the lower part is so formed that each tooth, as it moves by, will raise the outer or weighted end. This movement brings the upper inner end of the pawl into one of the recesses, but before the tooth touches it the lower part is freed from its tooth, allowing the weighted end to drop and thereby remove the upper part away from the wheel, as indicated by the dotted lines. This motion is of course made possible by the slow movement of the cylinder. But if, from any cause, the cylinder should move rapidly, the pawl would be brought into engagement with one of the teeth of the wheel, and the motion of the cylinder would be arrested. The device, as will be understood, is positive and absolutely reliable in its action, and can be placed upon any instrument without necessitating a change in the arrangement of the parts.

A New Rubber Supply.

We mentioned some time ago that a new industry was attracting attention at Rio Pardo, Minas Geraes, namely, the production of rubber from the milk of the *mangabeira*, a tree of the family of *Apocyneas* and very common there, as well as in the north of the empire. According to a letter written from the city (Rio Pardo), at first only the fruit was used, but later it was proved that the milk, very abundant in the trees, and which may be extracted in the same manner as is in use with the *Sypho nia elastica*, by incisions, becomes readily converted into excellent rubber, equal if not superior to, as we are assured, that produced in the Amazonas. Further, it is stated that the preparation is very easy, for if 85 grammes of alum dissolved in 3 liters of pure water be added to 3 liters of the milk, coagulation is perfectly secured and rubber obtained, which should be exposed to the sun for a few days. The latter states that a jug (*garrafa*) of this milk sells in Rio Pardo at 200 to 250 reis, and that many people are employed in its extraction; also that the first shipment of rubber had been made to Bahia; it weighed 250 arrobas, and the result is anxiously awaited.—*Rio News.*

PETROLEUM AND ITS APPLICATION TO THE RUNNING OF LOCOMOTIVES.

The petroleum industry is, as well known, daily becoming more and more extensive. The naphthas derived from the country of the ancient Guebers of Baku, and especially from the peninsula of Apcheron in the Caspian Sea, are now being collected industrially, and seem as if they were to come into formidable competition with those of America. In fact, there are at present more than six hundred wells in operation in the Baku region, where, in 1873, there were but a few only. The annual production of naphtha, which in 1832 was 2,500 tons, rose to 28,000 in 1870, reached 410,000 in 1880, and even exceeded this figure in the first half of 1884. The wells are operated by powerful corporations, and notably by the Societe Nobel, which alone extracts half the oil that the Baku region yields, and which has applied some improved apparatus that has permitted it, so to speak, to completely transform this industry.

The naphtha deposits are concentrated around Baku in strata of Miocene marls and limestone that are peculiarly contorted, and exhibit numerous folds, which form so many reservoirs, in which the mineral oils collect. The boring of the wells presents no very great difficulty in these calcareous rocks, and, as a general thing, the wells are not driven to a greater depth than from 260 to 325 feet. The work is thus effected under more advantageous conditions than it is with American petroleums, the deposits of which are met with at a much greater depth. The yield of the wells is very variable by reason of the great irregularity of the folds of the calcareous strata, some wells being found that are perfectly dry right alongside of others from which petroleum spurts in abundance. There is even cited a well recently driven by the Societe Nobel that would have discharged 8,000 tons per 24 hours had not the necessary arrangement been made to shut off the flow and collect the oil only for a few hours during the day.

The extraction of petroleum in the Baku region is concentrated around the village of Balakhani, about nine miles distant from the town of Baku, whither the crude oil is carried in order to be distilled in the refineries situated in the suburbs. At present the carriage is effected upon a small railway constructed for the purpose; but there has also just been laid, as in America, a pipe line, in which the oil will run directly from the wells to the distilleries.

As cast iron allows carburets of hydrogen to ooze through it, the pipes, which are from 7 to 8 inches in diameter, had to be made of forged iron.

The material as it reaches the refineries is in the form of a dark brown liquid, which, upon distillation, gives products that are more or less volatile. The first product disengaged is benzine—a volatile liquid employed mostly for cleaning fabrics. Afterward comes kerosene, which gives off no vapors at the ordinary temperature. Aside from this product, the same distillation gives a yellowish petroleum called "solar oil," which is used for street lamps. The residuum of the distillation forms a heavier liquid, of medium density, called "masoute" or "astatki," which is principally used for heating the generators of the locomotives on the Baku-Tiflis line, and those of the boats on the Caspian Sea.

The use of petroleum for heating boilers presents decided advantages in certain cases, since we thus obtain a fuel which, although it is perhaps of a higher price, possesses twice the calorific power of coal, and allows us to increase the vaporization, while at the same time diminishing the charge. This is a valuable feature, as regards its application to steamboats (especially to torpedo boats), as well as to the locomotives of express trains, upon which, in fact, petroleum furnaces are often used.

Mr. Urquhardt, engineer of the Gratzi-Tsaristsin Railway (southeastern Russia), has made a specialty of this question, and has succeeded in constructing furnaces which are peculiarly well adapted for the combustion of petroleum, and by means of which he has been enabled to greatly increase the power of locomotives.

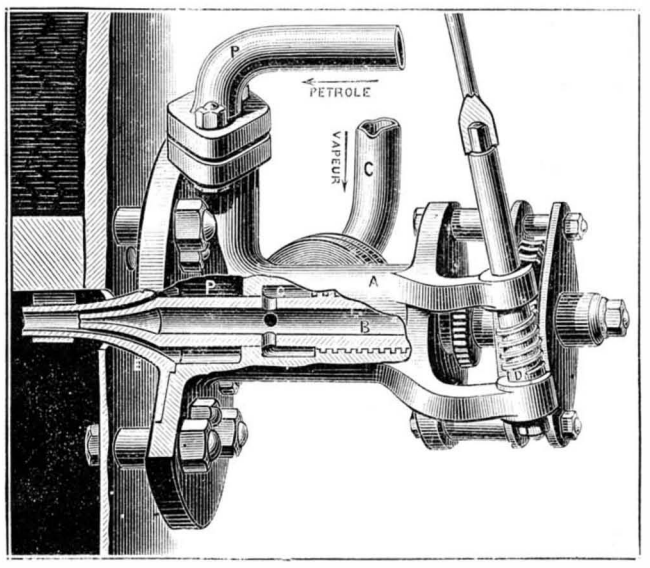


Fig. 2. PETROLEUM INJECTOR.

Figs. 1 and 2 show the latest form of the apparatus, and Fig. 1 gives the general arrangement of it upon a locomotive and tender. It will be seen that the furnace is internally provided with brick domes. These are designed to protect the metal, and, at the same time, through a combination of flues, to secure an intimate admixture of the petroleum with the sucked-in air. The petroleum is forced by a current of steam into an injector, which is shown in detail in Fig. 2, and from thence to the bottom of the furnace. Here it becomes lighted in contact with the current of sucked-in air that enters, as shown by the arrows, through a trap in front of the ash box. This air has already been heated on traversing A by coming into contact with the two masonry arches of the furnace. A portion of the flame is directed by the flues, B, to the bottom of the tube plate, which it strikes directly. An inspection of Fig. 1 will show at once how the apparatus operates. The petroleum contained in the front compartment of the tender is heated by a current of steam from the boiler that enters through the pipe, S, and after traversing the worm enters the side of the feed pipe, P.

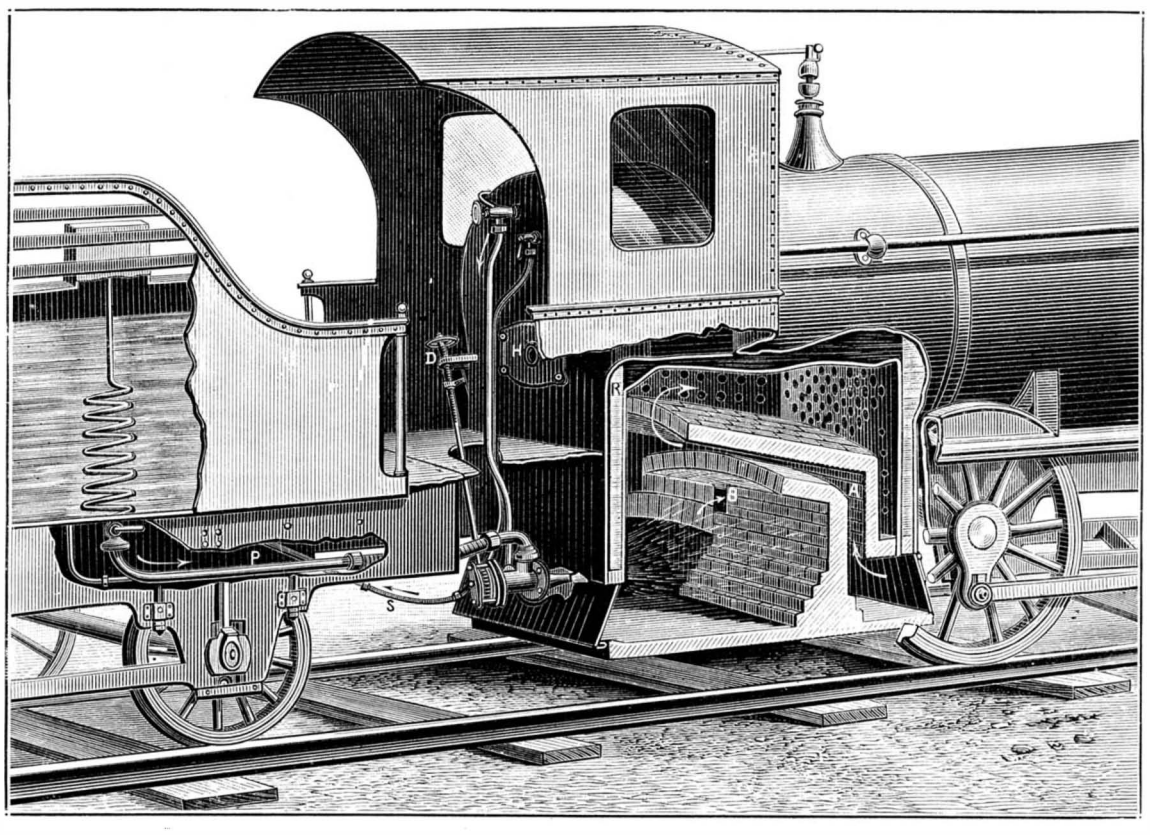


Fig. 1.—ARRANGEMENT OF A LOCOMOTIVE BURNING PETROLEUM.

On making its exit from the latter, the petroleum enters the injector, shown in section in Fig. 2, and flows around a central nozzle, B, which is traversed by steam that is coming from the boiler through the pipe, C. The mixed current that forms is disengaged, as shown in Fig. 1. In former arrangements the injector was adapted to the top of the furnace frame, and had to cover both that and the side of the fire box, thus making it more costly.

It will be seen that it is very easy to regulate the combustion from the engineman's cab by acting upon the injector through a rod, D, that terminates in an endless screw, which gears with the pinion of the nozzle and permits of opening the latter to any degree desired. In this way the combustion is regulated with as absolute certainty as could be done with gas, and all waste of fuel is avoided.

Before entering the reservoir of the tender the petroleum passes through a filter that retains foreign matters, and is again filtered upon making its exit. The arrangement of the nozzle is such, however, as to

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give passage to any solid matter that the current might carry along. At the bottom of the tender there is a special reservoir, in which accumulates the water that crude petroleum always carries along with it, so that the oil reaches the injector in a very pure state.

The firing up of this apparatus is effected by means of a current of steam from a neighboring boiler. The steam is directed into the vertical pipe seen back of the fire box, and following the direction shown by the arrow, reaches the injector and causes the petroleum to flow in.

Another portion of the same current is directed by a three-way cock at the orifice of the pipe into the blower conduit, and finally enters the smokestack and increases the draught. The pressure quickly rises in the boiler, and reaches three atmospheres in 45 minutes, and even eight in 20 minutes with water that is already warm.

It should be remarked that there are certain precautions to be taken in firing up, in order to prevent the explosion that might occur through the petroleum vapors already accumulated in the furnace. The injector is first blown out by a current of steam, while at the same time the doors of the ash box and the blower are opened in order to suck the vapors out of the furnace. After this there are placed therein a few rags soaked with petroleum, which are lighted in order to communicate fire to the jet that is entering from the injector. The fire thus started afterward keeps up normally without any difficulty and without there ever being any need of tightening up the escapement in order to quicken the draught, seeing that the flame meets with no obstacle to its disengagement.

The regulation, moreover, as we have just seen, is effected with the greatest ease by acting upon the rod, D, of the injector nozzle. The discharge of petroleum is estimated according to the position of the said rod in its fixed nut, and the behavior of the fire can be watched through the sight-hole, H. In a word, we have here a very clean and easily managed fuel, and one that is in certain cases more economical and more advantageous than a solid one. It produces no sparks, and does not appear to be accompanied with any danger from fire in cases of accident.—*La Nature.*

How Starch is Made.

The Indianapolis *Sentinel* describes a visit to the Franklin Starch Works of Thompson, White & Co., where so called non-chemical starch is made.

The works are located in the northeast part of the city on a ten acre lot, usually known as the Old Fair Grounds. The buildings cover three acres of ground. The main building is 150 by 200 feet, two stories high. Just south of the main building is a large crib with a capacity of 70,000 bushels of corn.

Near the east side of the main building are the large vats for the reception of the coarse feed, and a little farther southeast are the gluten vats—two in number, 16 by 200 feet, and about 4 feet deep. Near the southeast corner of the main building the corn is carried by a belt from the crib to the sheller, which has a capacity of over 1,500 bushels a day, and is run by a separate engine of forty horse power. After the corn is shelled it is carried to the "cleaner," where all the dust and dirt is removed. It is then by means of an elevator deposited in a long bin in the upper story. By means of separate spouts the corn is conveyed into fourteen large "steep tanks," holding 600 bushels each. After being covered with hot water it is allowed to remain six days, or until it is sufficiently soured. It is then by a screw conveyer and elevator taken to the millstones hopper. Just before it reaches this point it passes through a revolving wire screen, which separates the corn from the water.

It is then conveyed to the mills, four in number, being mixed again with water, and after going through two sets of four foot millstones it passes below to the "shakers." These are vibrating boxes, open at one end and covered with a wire and satin sieve. Here the starch and gluten are separated from the solid particles of the corn, which is called "coarse feed." This descends into a well, and is pumped up by means of a powerful force pump, and run off into vats for its reception, where it is drained and is ready for sale. After passing through the "shakers," the starch and gluten is conveyed to the "run house," receiving on its way a stream of water. The run house is a room 100 feet square, containing 56 troughs, about 18 inches wide and 100 feet in length. These runs are slightly inclosed, and while passing through them the starch settles to the bottom, while the watery part passes off and is run into the gluten vats. The starch is then conveyed to the agitator wells, and, being mixed with cold water, is thoroughly agitated by means of a revolving rake. It is then pumped up and passes through a bolting reel, where all the impurities are separated, and the pure starch conveyed, by means of pipes, to 63 settling tubs. The water is then drawn off, and the starch, pure and white, is conveyed to a large receptacle, where it is placed into the mould boxes.

After remaining in the mould boxes three to four hours it is cut into blocks about 6 inches square, elevated to the second floor, placed on cars, and run into the crusting room, where it remains over night. The next morning the blocks are scraped, or rather the crust cut off with sharp knives, and are wrapped in blue or bronze paper, by one person, at the rate of 800 packages per hour. These packages are placed on cars with slatted frames, holding 392 packages each. About 100 of these cars are used. As they are filled they are run into the dry room, which is kept at an average temperature of 160 degrees by means of steam pipes. The starch is kept here until it is thoroughly dried into the prismatic form in which it is purchased in the market. The cars are run to the wareroom and the packages wrapped in blue paper or packed in boxes, while those in brown paper are conveyed to the packer and packed in barrels by means of a flour packer, at the rate of 200 barrels a day.

The principal brands of starch manufactured by the Franklin Works are the "Acme," for laundry purposes, "Pure Corn" and "Powdered," for confectioners and baking powder manufacturers. All of these brands have a high standing in the market, and find ready sale in all the principal markets of the country. The machinery is all of the most approved pattern, and is, by various ingenious devices, made to do the principal part of the work. Still, about fifty men are employed when the works are in operation.

To obtain a superior quality of starch the corn must first be properly steeped, and the operator in this department must have skill and experience. To secure starch from corn in paying quantities it must be properly ground. The next important point is in the sieving. The smallest hole in the sieve will admit impure matter, which it is hard to eliminate. Again, particular attention is required in the precipitation of the starch on the inclined plane. In the dry room great attention must be paid to the temperature; too high a temperature will produce a scorch, and too low a mould.

The Synthesis of Ammonia.

Mr. G. Stillingfleet Johnson has recently published a condensed account of the proceedings of himself and others in the direction of producing ammonia from atmospheric nitrogen. Mr. Johnson has on previous occasions explained the fact that ammonia is not always obtained in the course of experiments intended for its synthetical preparation, by starting the hypothesis of a second form of elementary nitrogen, having the same relation to the ordinary form of the element as ozone has to oxygen. He is inclined to hold that this active form of nitrogen loses its power by being heated, resembling ozone in this characteristic. Like other chemists, Mr. Johnson has failed in all attempts to produce ammonia by passing atmospheric nitrogen, recently heated and then mixed with hydrogen, through red-hot tubes in presence of platinum sponge. He has, however, obtained ammonia from atmospheric nitrogen which had not been heated, by mixing it with pure hydrogen in the presence of platinum sponge.

The nitrogen was first made to pass into a glass gasholder, traversing a vessel filled with sawdust saturated with freshly precipitated ferrous sulphide. The nitrogen was then allowed to stand for some days over water holding ferrous ferrocyanide in suspension; and was afterward passed in succession through caustic potash, alkaline pyrogallate, strong sulphuric acid, and Nessler reagent. The hydrogen used was carefully purified by successively passing it through a mixture of chromic and sulphuric acids, and through Nessler reagent. The consequence was the formation of ammonia always, except when the nitrogen had been heated. The quantity of ammonia was small, never exceeding 1½ milligrammes from 10 liters of hydrogen.

The crowning experiment for the production of ammonia by direct synthesis is thus described by the author: Into an ordinary eudiometer tube, full of mercury, admit a measured quantity of pure nitrogen gas. Next introduce three times its bulk of pure hydrogen, and insert in the gaseous mixture a fragment of wood charcoal which has previously been ignited in hydrogen gas, or, better, in a mixture of three volumes of hydrogen with one volume of nitrogen. Let the spark be now passed continuously through the wires of the eudiometer. About 4 to 6 cubic centimeters of the mixture are combined and absorbed by the charcoal per hour, until the whole of the gas disappears. The charcoal will now be found impregnated with ammonia.

FORTY-FIVE models have been submitted for the statue of J. J. Rousseau, which is to be erected in Paris. M. Carrier-Belleuse, who is never stereotyped, represents the philosopher in the fields studying a flower which he holds in his hand, and several other sculptors have been inspired with a similar idea, although they may have not carried it out so well. Jean Jacques Rousseau is looked upon in England simply as an impassioned writer who was one of the forerunners of the Revolution, the "Declaration of the Rights of Man" being an abstract of his "Contrat Social." But he was also the author of a dictionary of botany, and his love of the country exercised an influence on his speculations.

PHOTOGRAPHIC NOTES.

HOW TO SENSITIZE AND TONE ALBUMENIZED PAPER.

Mr. W. B. Tyler, of San Francisco, Cal., Secretary of the Pacific Coast Amateur Photographic Association, gives the following as the method he has successfully worked: A sensitive silver bath is first made in the following proportions:

Distilled water	1 oz.
Nitrate of silver	45 gr.

The sheet of paper is floated on this for 90 seconds, then drawn off over a glass rod at one end of the bath, drained, and blotted off with blotting paper, and finally dried with heat.

The sheets are then hung up in a fuming box having a saucer containing some strong liquid ammonia placed on the bottom. After remaining in the box for 20 minutes and sometimes longer, which corrects all acidity that may have been in the bath, the paper is removed and then is ready for printing.

The paper should be printed rather deeper or darker than is customary for several toning baths, otherwise it will bleach out too much.

After using the nitrate bath it is carefully sunned, and is then decanted and filtered, perhaps once a month. The

Toning Bath

is made of:

Water	32 oz.
Chloride of gold	8 grns.
Bicarbonate of soda, quant. suff.	

to make the bath slightly alkaline when tested with red litmus paper.

A pinch of common salt is also added.

Before toning, the prints are carefully washed in three or four waters, a small quantity of acetic acid being added to the first water. The toning should be carried up to a rich purple; the prints are then washed and fixed in fresh and strong solution water and hyposulphite soda, known as the "hypo bath," for fifteen minutes.

We have seen some excellent prints made by this formula; it can be recommended as being reliable.

REDUCING GELATINE CHLORIDE PRINTS.

Messrs. Ashman & Offord relate in the *Photographic News*, their method of reducing overprinted chloride prints which have been toned and fixed, and are still very much too dark, is to put into a reducing agent composed of:

Cyanide of potassium	1 gramme.
Liquid ammonia	1 cub. cent.
Water	1 liter.

The prints should be agitated in the above solution until the desired reduction has taken place. When it is intended to reduce glass positives by this means, it will be better not to tone quite so much, since the reducer has a tendency to slightly gray the image.

ENLARGING DIRECT BY REFLECTED LIGHT.

The same gentlemen suggest the use of the gelatine chloride picture on opal glass as a medium to be copied and enlarged from.

When large-sized pictures are required from a small but satisfactory negative, it is usual to make the transparency and enlarged negative by transmitted light.

Objections to this plan have been frequently pointed out. In the gelatino-chloride process a good positive on an opal plate obtained by contact printing is first made, and this is copied direct by the camera, the image being enlarged in proportion as the camera is placed close to the picture.

The resulting enlarged negative contains all the delicate shading shown in the opal plate, without any grain.

The color of the print on the opal can be easily varied to suit the strength of the negative, and the surface can be worked up in monochrome, which does not in any way affect the enlargement, unless the latter exceeds four diameters.

City and Town Schools.

A report on the city school systems of the United States has been prepared for the Washington Bureau of Education by Dr. J. D. Philbrick. The latest accounts which are available are those of 1882, and up to that year the total expenditure on 259 cities and towns was $27,894,427. The school property was supposed to be worth $94,294,153. There are two plans proposed for promoting industrial education. One is by annexing the workshop to the school for general education, whether elementary or higher. This mode is sometimes called the putting the workshop into the school. The second is by establishing technical schools for apprentices, consisting primarily of the requisite shops, with appliances for giving the theoretical instruction applicable to the trade taught. This mode has been denominated the putting of the school into the workshop. Dr. Philbrick advocates universal evening drawing schools, evening technical instruction similar to the English science and art classes, evening technical schools after the French model, the establishment of one or more apprenticeship schools in each city, simple manual training schools for the smaller towns, and more highly organized ones in the greater cities.

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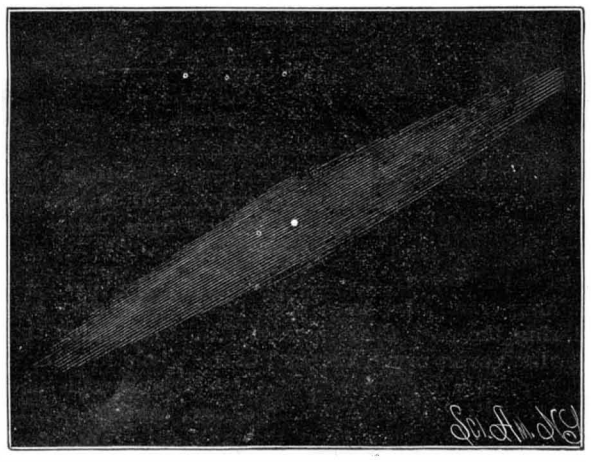
THE WONDERFUL NEW STAR IN ANDROMEDA.

On Wednesday, September 2, a cablegram was received at this observatory, *via* Harvard College Observatory, announcing the discovery by Hartwig, of Strassburg, of a star-like nucleus in the great nebula of Andromeda. The same evening being beautifully clear, I turned the large telescope upon the object, and was astonished at the marvelous spectacle. I am as familiar with the great nebula of Andromeda as the page of an oft-read book, having examined it hundreds of times in making my cometary sweeps. All that was ever seen before at the center of the nebula was a broad, diffused condensation; but here was a bright star-like disk, hard and well defined with all powers of the telescope, high or low. A *new sun* had suddenly appeared, apparently in the middle of this well-known nebulous mass. In later observations it had attained to the sixth magnitude in brilliancy, and was perceptible to the naked eye. A small telescope will show it well. In large instruments, with a low power and wide-field eye-piece, sufficient to take in the whole nebula, which is two degrees in length, the sight is a fine one, especially to those who are familiar with the former aspect of the nebula. I append a drawing of the nebula with the new star therein. The form of



NEW STAR IN ANDROMEDA NEBULA.

the nebula is a very elongated ellipse. On a clear night it is visible to the naked eye as a misty patch of light, and has been often mistaken for a small comet. The following directions will enable any one to find it:

First find the constellation Cassiopea, which in the early evening is well up in the northeastern sky. It resembles a chair now lying on its back. A line drawn southward through stars forming the front corner of the seat and the bottom of the back leg of the chair will nearly intersect the nebula, which is situated at a point on this line about three times the distance from the lower star as the space separating the two stars mentioned.

Every intelligent person should obtain a view of this celestial wonder, one of the most remarkable in astronomical annals.

Is it a temporary or variable star between us and the nebula? Or is it the condensation of the nebulous mass into a central sun, and hence a marvelous confirmation of the nebular hypothesis?

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., Sept. 5, 1885.

The Commercial Production of Hydrogen.

The old problem of the cheap production of hydrogen by decomposition of steam is being attempted afresh by MM. Hembert and Henry. The process employed by these chemists consists essentially in passing steam, superheated to the point of dissociation, over incandescent coke. There is thus immediately produced a gaseous mixture formed of equal volumes of hydrogen and carbonic oxide. This mixture passes into a second retort heated to a full red, into which is admitted a fresh quantity of steam at the same temperature as the former. This steam acts upon the carbonic oxide, and causes it to pass into the higher state of oxidation, that is, into carbonic acid. The volume of hydrogen produced by this second reaction goes to join that already formed; so that, when the operation is perfectly managed, 3,200 cubic meters of hydrogen can be obtained from a ton of coke. The hydrogen is afterward purified with lime, to get rid of the carbonic acid; and there remains with it only a small proportion of carbonic oxide.

MM. Hembert and Henry are now organizing a factory for the production of hydrogen by their method; and they hope to find a use for the gas in heating and lighting. In what way, says the *Journal of Gas Lighting*, this hope is to be realized we are not informed. At present it would appear that nothing could be much more useless, in a commercial sense, than hydrogen prepared in this way, and at the cost which must necessarily be incurred. The only novelty in the proposal lies in the suggestion to divide the process into two stages; but the practical utility of this idea remains to be proved.

Correspondence.

The Solar Nucleus.

To the Editor of the Scientific American:

In regard to the experiment mentioned in the SCIENTIFIC AMERICAN for August 8, 1885, of heat becoming invisible on account of intensity, may this not show that the nucleus of the sun, which is disclosed during sun spots, is dark simply on account of the excess of heat? According to the experiment, the heat required to darken is very moderate indeed, not the one one-hundredth part of the estimated temperature of the sun; and if equal brilliancy of light implies equal intensity of heat, the solar excess might be accounted for in some such way as this.

EDWARD J. PATEK.

361 Carroll Ave., Chicago, Ill.

Poisonous Lard Oil.

To the Editor of the Scientific American:

A recent experiment with what is termed low grade lard oil, or bolt oil, has convinced me that machinists and others cannot be too careful to keep it from any slight abrasion of the skin, as the following will prove. Having to fit some new dies to my bolt cutter, and testing their operation, my hands became covered with this so-called *lard oil*. A slight and almost unnoticed abrasion of the skin below the nail of my left thumb allowed it to come in contact with the flesh beneath; in about an hour it became, first red and painful, then tumid, and finally black, showing unmistakable signs of blood poisoning, which resisted all remedies until cauterized with caustic potash.

Upon this becoming partially healed, I returned to my experiments, having taken the precaution to well protect the injured part by wrappings; but some of the oil found entrance under the edge, and remained in contact with the skin all day, the consequence of which was that the animal poison was again absorbed by the *sound* but tender skin, and became diffused all over the thumb and as far as the wrist. It could only be checked by further cauterization and poulticing, bathing the wrist and arm with iodine and aconite, and at every renewal of poultices bathing the broken skin with a tepid weak solution of carbolic acid, viz., 3 drops saturated solution (20 per cent water to crystals) to 1 pint of soft water. The skin has separated from nail to wrist, and after intense suffering for two weeks is slowly healing under a covering of old linen dipped in "cosmoline." Query: Was this oil made from the fat of diseased animals, that is, "boneyard oil"? OPERA MUNDI.

Syracuse, Aug. 21, 1885.

American Inventions Wanted in Egypt.

To the Editor of the Scientific American:

I have been requested by some of the principal land owners to call the attention of American makers of agricultural machinery to the fact that there does not exist a satisfactory thrasher in Egypt. Some few have been imported from England and other countries, but the results have been unsatisfactory, and the machines laid aside.

To bring this properly before the manufacturers of such goods, I can think of no better method than asking a place for this letter in the columns of the SCIENTIFIC AMERICAN.

The amount of land sown in wheat is probably about 1,000,000 acres, producing about 15,000,000 bushels. Low prices have recently caused a greater breadth to be devoted to beans.

The Egyptian grain is rather small and tough, particularly that of lower Egypt. The complaint is made that the thrashing machines brought out here are useless, as they crush the grain. The manipulation of the straw is also a very important point.

The actual process of getting out the grain is perfectly described in the sculptured and printed scenes in the tombs and temples handed down from the days of the Pharaohs, thousands of years ago, or from the scene given in the illustrated Bible.

In the former case, we have a herd of animals driven around and around the mass, treading out the grain and pulverizing the straw. In the second, a small car with a number of sheet iron wheels is driven around the mass until it is completely triturated. Then follows the winnowing in good old scriptural and Pharaonic fashion.

This process is naturally a matter of time, in fact about two months are required to get out the crop.

As the Government has now arranged that the collection of taxes shall be by installments as the different crops are ready for market, time, a long neglected quantity, becomes valuable, and at last there is pressing need for some cheaper and more expeditious method of getting out the grain.

Although there some very large landed estates in Egypt, except in the case of the Daira and Domains (the estate formed by Ismail Pasha, ex-Khedive), there are but few large tracts, containing upward of 1,000 acres, the property of any one individual.

The village system tends very much to the infinitesimal division of land. We may safely assume the average area of a village at 1,000 acres, and that one-third of this would be planted in wheat, producing about 4,500 bushels.

At harvest all the wheat from the 300 acres would be brought up to the thrashing floor and stacked in as many piles as there are owners, with the exception of that belonging to the wealthy proprietors, who have generally small villages near the main one.

Each proprietor now sets to work to get out his grain, either by treading it out or by using the car or horag.

Of course nothing can be done with the grain until the whole mass of straw has been winnowed out.

As for the straw, it has been cut and pounded into chaff, the ends of the broken bits being rounded and softened.

The next village would be situated at a distance of one or two miles; this brings us to the point that one of the essential conditions of success for a thrasher in Egypt is that it must be transportable, and, allow me to add, over very bad roads.

There is also the straw to be considered: whether it be that the Egyptian straw is very hard, or else highly glazed, or that the cattle are not properly educated, it is said that animals will not eat it unless it has been subjected to the process of trituration, as shown in the treading.

Therefore some means must be found of preparing the straw.

It is generally understood here that it is sufficient to explain a need to an American manufacturer to have him set to work and produce the required machine, provided he sees a proper profit; it is also said that the American manufacturers have furnished machines suitable to the varying requirements of their own people and neighbors, and that they perfected a machine for use in Russia.

Believing this, my friends feel sure that should some of the American establishments turn their attention seriously to the study of the wants of Egypt, a proper machine would quickly appear, and that its successful adoption would be most handsomely repaid.

It must be borne in mind that for agricultural machinery Egypt is almost a virgin soil, and that it will pay any house a very handsome profit to properly study her needs. The harvest in Egypt lasts during the months of April, May, June, and July. At the same time, attention might be turned to plows or cultivators for cotton and cane.

A properly protected patent in the United States and Europe would be respected here, as manufacture of such implements in Egypt is almost impossible, owing to the high price of skilled labor and the necessity of importing all the materials.

I shall be most happy to assist any one coming to Egypt with a view of studying this question, and promise to present him to some of the principal land holders and agriculturists, who will see that every facility is given for study and examination.

I only ask that such person be a responsible agent of some well-known firm. I have the honor to be your obedient servant, A. MACOMB MASON,

Inspector-General Cadastre.

Cairo, Egypt, Aug. 14, 1885.

Nets versus Torpedoes.

For some years past the attention of naval officers in England has been directed to perfecting nets, for defending their ships against the attacks of offensive torpedoes. The series of maneuvers executed by the evolutionary squadron in Blacksod Bay, Ireland, proves that the nets employed in the British navy afford a perfect protection against any torpedoes in use, without seriously retarding the speed of the ships, as is so well shown in the sketch and article on this subject by Mr. F. Villars in the *Graphic* of the 18th of July. But no sooner has this system of defense been perfected, at a cost of £75,000, than they are called upon to find other means for defending their ships, as the "Berdan" system of torpedoes renders these nets perfectly useless. This is done by employing two torpedoes in place of one; the first of these being accurately steered against the net serves as a fulcrum for the second, which (although possessing its own motive power, is partly towed by the first), by means of a horizontal rudder which drops when the towing cord is slackened, dives under the net, and is then by the same cord directed upward until it explodes under the bottom of the ship. Therefore, in the opinion of experts, the net is an advantage to this system, rather than a disadvantage, as it furnishes the means for striking the ship at a more vulnerable point than when the torpedo strikes her side, which it must do if nets are not employed.

This system, as shown to the English government, has also another mode of attack, which consists in exploding the first torpedo against the net to form a breach for the second one to pass through and strike the side of a ship, but it is believed that the first system is preferable, owing to the advantages stated.—*Constantinople Express.*

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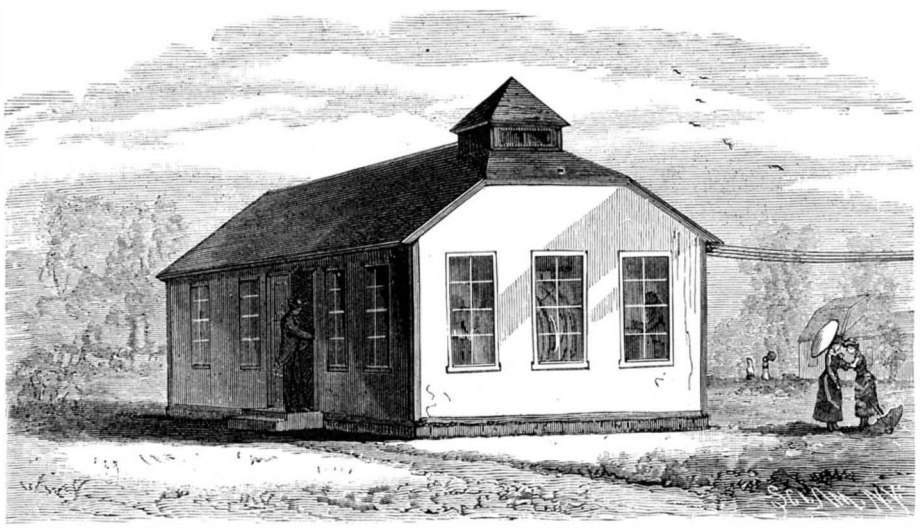
THE GREAT TANGENT GALVANOMETER OF THE CORNELL UNIVERSITY.

(*Continued from first page*).

ameter, consisting of 100 turns of No. 18 wire, is suspended, so that its center coincides with the center of the instrument, by means of a single phosphor-bronze wire, which is itself attached to a torsion head reading to 10 seconds of arc. By the aid of this coil, observations may be taken at any moment for the determination of H by the method proposed by Sir Wm. Thomson.

The instrument is mounted in a copper building (shown in the small engraving), from the construction of which all iron has been rigidly excluded. Several conducting wires connect the building with the dynamo and other rooms of the physical laboratory, 550 feet distant, and switches in the building serve to send the currents through the several coils of the galvanometer singly, in series, or in multiple arc, direct or reversed. By this means currents from 1 milliampere to 250 amperes can be accurately measured.



GALVANOMETER BUILDING.—CORNELL UNIVERSITY.

Revival of an Old Armor Belt.

Mr. McIntyre, late superintendent of construction of the English warships Swiftsure, Triumph, and Terror, has patented a new type of armor plate. The design includes the complete protection, at the water line, of warships by a ⊱-shaped armor belt.

The two plates forming the belt would have a horizontal projectio of 5 feet and a vertical height of 10 feet, or each plate would be on an angle of 45°. The upper plate, in a design submitted, would be 8 inches thick by 7 feet wide, the lower plate 5 inches thick by 7 feet wide, and below all is a vertical plate 9 inches thick by 2 feet wide. The apex of the "⊱" would be at the water line.

Mr. McIntyre calculates that the resisting power to shot is doubled by the inclination of the plates, and that the saving in weight over vertical plate of equal resistance is as 7 pounds to 10 pounds. Among the other advantages it makes ramming by an enemy's ship dangerous work to the attacking party, the overhang forms a good point of attachment for torpedo netting, and, by adding to the ship's beam at the water line, it will materially steady the vessel in rough weather. *Engineering News* says the expedient is simple and seems effective, but the idea is practically antedated by the rams Vindicator and Avenger, built about 1864 for service in the Mississippi Squadron during our own late war, where the "⊱," however, was solidly packed with wood.

Salicylic Lemonade.

As a "hospital beverage," says the *British and Colonial Druggist*, which has lately been found of great value in typhoid and other fevers, scurvy, and gout, the following cannot be too widely known, it having been, we understand, first devised by a late medical officer attached to the Soudan expedition: Fruct. limoni, No. 10; acid citric, ½ oz.; acid salicylic, 200 grains; sacch. alb. and water, q. s. Squeeze the lemons, and put the juice aside; boil the fruit in half or three-quarters of a gallon of water for fifteen or twenty minutes; after standing for six hours take out the lemons, and again press them before throwing the exhausted pieces away. Add the juice and citric acid to the liquid, boil five minutes, and strain. While hot add the salicylic acid, and stir until dissolved. Sweeten to taste with white sugar, and make up the bulk to one gallon with water.

Salicylic lemonade may be taken freely, either of the strength here given, or diluted with half its bulk of water. It should be freshly made every two or three days, unless it be permissible to "qualify" it by the addition of a little pure French brandy. If required to be in a "bright" condition, add, when cold, a little beaten up with white of egg. Boil for three minutes, and filter. If found too harsh for some tastes, dissolve in the boiling liquid, before straining, half an ounce of Nelson's patent opaque gelatine, previously swelled for five hours in cold water.

A Western Cannon.

On memorial day in Griggsville, Ill., a cannon was used which was presented to the late Col. R. B. Hatch by the 7th Iowa Regiment in 1861, at Cairo.

This cannon was manufactured in a machine shop in Iowa or Missouri by an ingenious mechanic.

The barrel is steel, 3 feet in length with 1¾ inch caliber, rifled, and is capable of sending a projectile five miles with the proper elevation.

It is exploded by percussion cap with back action lock and hammer, like an ordinary fowling piece.

The breech pin can be detached at each charge, and cooled in water, which in a certain degree would prevent premature explosion. H.

IMPROVED BLOOMING MILL

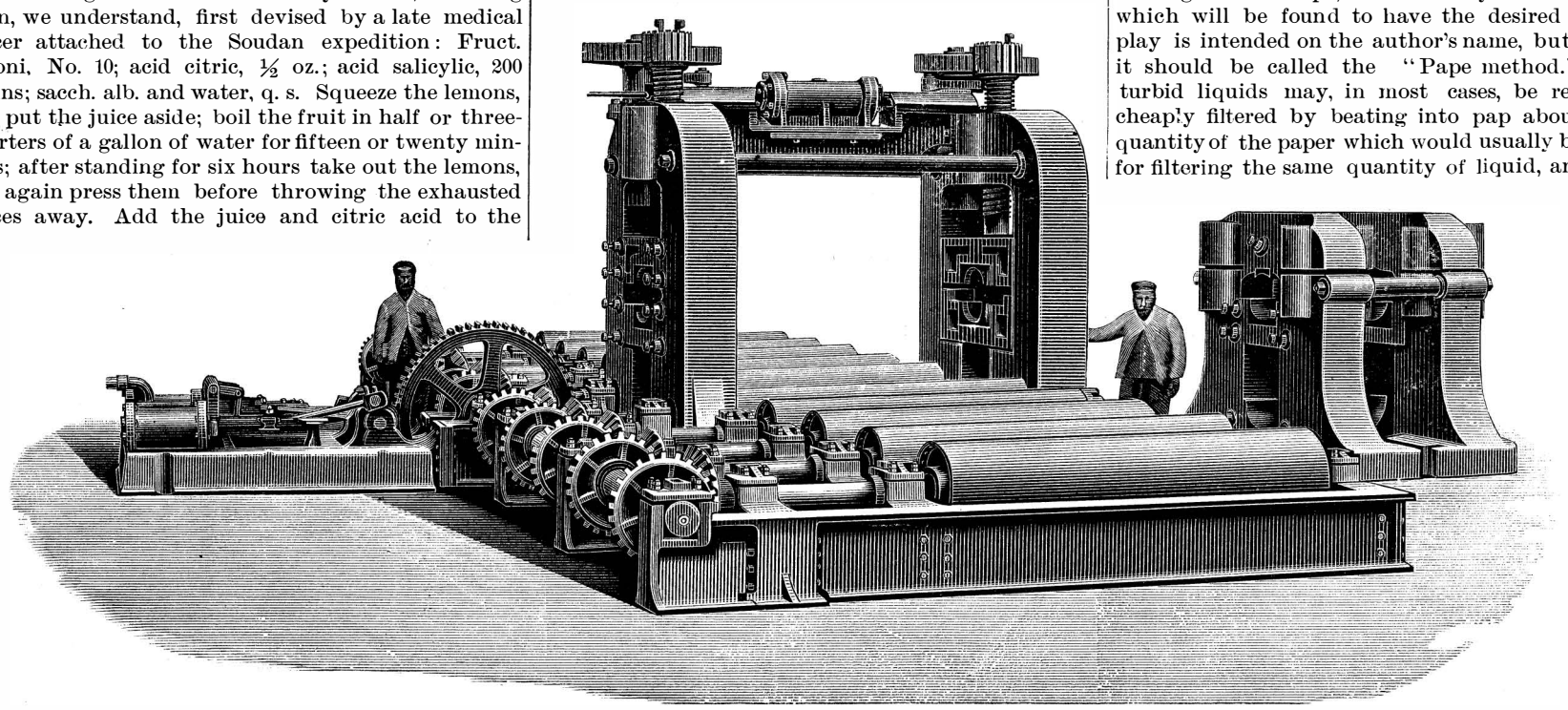
The blooming mill which we illustrate was constructed by the Tees Side Iron and Engine Works Company of Middlesbrough, for the Sociedad de Altos Hornos y Fabricas de Hierro y Aciero de Bilbao. The rolls, which are not shown in the engraving, are 39 in. in diameter, and each of them weighs 14 to 15 tons; the standards weigh 20 tons each. The mill is driven by a pair of reversing engines connected in the ordinary way by means of wabblers and boxes to cast-steel pinions 39 in. in diameter, with helical teeth 2 ft. 5 in. wide. The roll-adjusting gear is placed on a strong cast-iron girder spanning the roll stand ards, and consists of a hydraulic cylinder with the piston rod projecting through each end, and attached by means of links to cast-steel spur quadrants, working into steel pinions keyed on to steel screws 10 in. in diameter; these, again, work into heavy cast-iron nuts fixed into the top of the standards.

The top roll is furnished with balance gear to keep the roll at all times in contact with the upper bearance. This balancing gear is placed underneath the mill, and consists of two heavy rods passing through each standard, which connect to the bottom bearance of the top roll, and are actuated by means of levers and balance weights.

The live rollers, which are of wrought-iron with cast-steel centers and steel shafts, are driven by means of cast-steel spur and miter gear, the motive power being supplied by a pair of reversing engines with cylinders 8 in. in diameter and 15 in. stroke. The whole of these rollers are carried upon heavy cast-iron girders with brass bearings.

These rolls form part of an exceedingly fine blast furnace and steel rolling mill plant with all the most modern appliances and improvements, including blooming, roughing, and finishing mills, reversing engines for rollers, the latter being of wrought iron with steel centers, steel shafts, and steel miter wheels. The plant also embraces a fine powerful shearing machine which weighs 85 ton, a hydraulic crane for lifting the cross ends from the shears, a hydraulic push-over gear for moving the blooms from the roughing to the finishing mill, a powerful sawing machine for cutting the steel hot with a neat arrangement of stopgear, and rail bench, nearly 100 ft. long, with an apparatus for moving the rails.

Engineering says: "The whole of the details have been carefully worked out, and reflect great credit on the engineers."



BLOOMING MILL FOR BILBAO.

The Boys in the Pennsylvania Coal Mines.

By a recent enactment of the Pennsylvania Legislature, boys under fourteen years of age, and all women and girls, are prohibited from being employed in the coal mines of that State, and most of the large coal mining companies have been discharging such help during the past three months. It is estimated that the law covers nearly one-half of the whole number of slate pickers in the mines, at which boys are sometimes employed when only six years of age, while it also includes a good proportion of the mule drivers and door tenders. The slate pickers sit in rows astride the chutes leading from the breakers, their eyes fixed on the broken coal steadily brushing by them down an incline, and acquire great expertness in picking out the dull slate from the glistening anthracite. The work is hard, in the stooping position and dust, and really seems but little removed from a hard form of slavery, yet these little workers form so important a factor in the means of support of many families, that it has required many years' agitation to get the law for their amelioration passed through the Legislature, and its enforcement now is causing no little excitement in the mining regions. Yet society undoubtedly owes it to itself to see that these little ones are at school, instead of being thus early predestined to a life of ignorance.

New Method of Filtering.

The filtration of turbid liquids sometimes presents great difficulties and no little annoyance. These liquids, which are difficult of clear filtration, may, according to Mr. Pape, be treated by a novel method, which will be found to have the desired effect. No play is intended on the author's name, but he tells us it should be called the "Pape method." In fact, turbid liquids may, in most cases, be readily and cheaply filtered by beating into pap about half the quantity of the paper which would usually be required for filtering the same quantity of liquid, and running this pap into the filtering funnels, the stems of which have been previously fitted with small plugs of cotton-wool, care being taken that the latter is quite free from fatty matters; such is the medicated cotton-wool supplied for surgical purposes. The funnel is therefore closed at its lower end with this pure cotton-wool, over this is placed the more or less fluid or pasty paper pulp, and over this again the ordinary conical filter paper.

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SALT IN ORNAMENTATION.

C. F. HOLDER.

Some months ago a party connected with one of the expeditions sent out by the government came to camp among the curious springs that form the chief attraction of the famous National Park in the West, and several days were spent here in making a thorough examination of the place, laying out maps, etc.

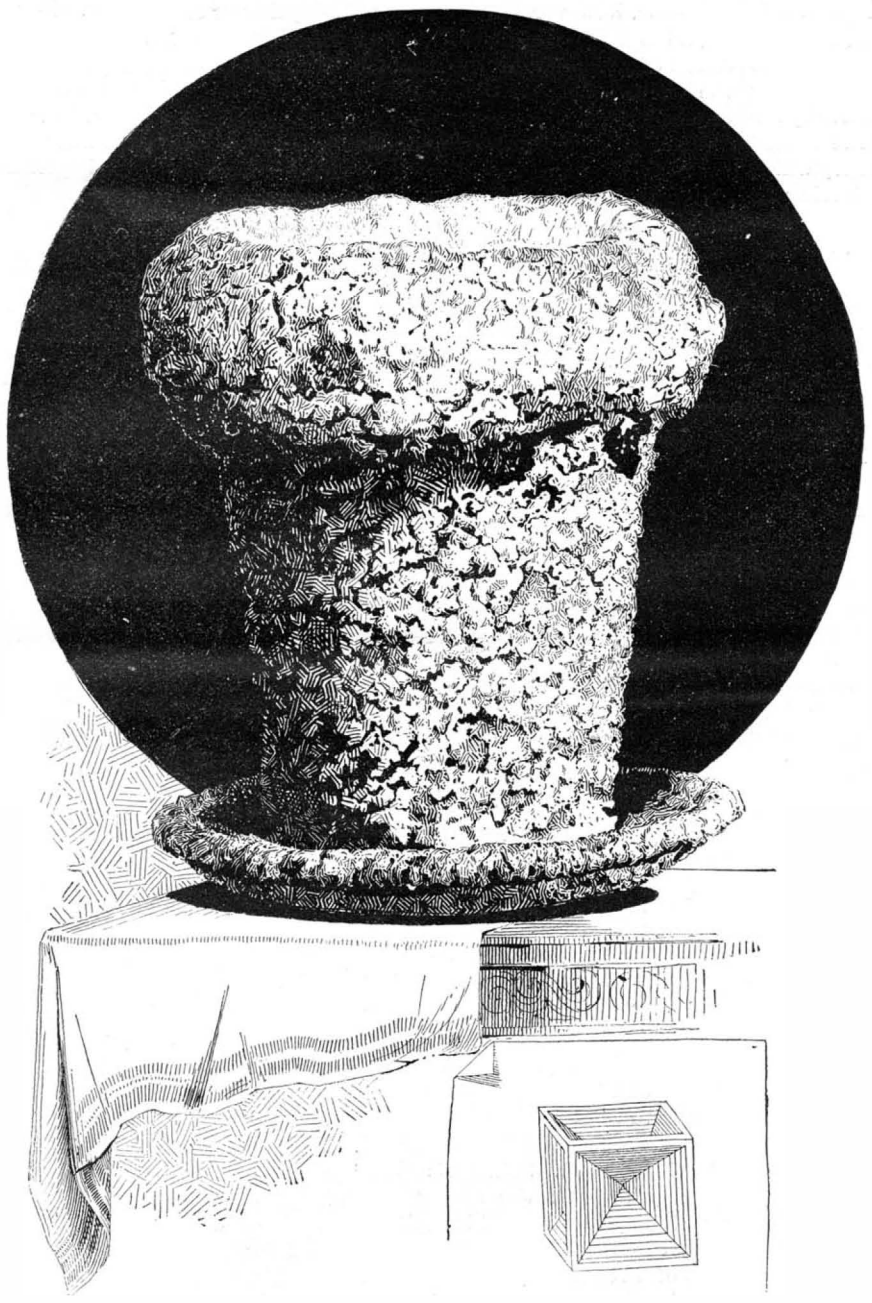
Several days after their arrival, one of the soldiers who formed a part of the guard reported to the leader, a well-known scientific man, that a very remarkable object had been taken from one of the springs and was awaiting his inspection. Eager for anything new, the scientist followed the man to the edge of one of the cones, and found, surrounded by the members of the party, an object about four feet long, of irregular shape and of the greatest beauty, resembling perhaps a piece of lace or some other extremely delicate fabric. It seemed impossible that so beautiful an object should have been taken from a hot spring of pure water, and various opinions were expressed as to its nature, and the scientists of the party were divided as to its nature. When lifted, it bent easily without falling apart, and retained its regularity of structure. After several days of investigation it was found that one of the soldiers had thrown a shirt into the water and lost it for the time, thinking that some comrade had stolen it in jest; but finally it occurred to some one to break the white, lace-like object, and in the interior was found the soldier's shirt. In short, by some peculiar action of the salts in the hot spring the white shirt had become coated with a rich white deposit, giving it the beautiful appearance referred to.

Every portion of the cloth was covered with the rich white forms, a growth without life as it were. The experiment of the shirt, though an accident, was not lost upon the observers; and at a recent meeting of the New York Academy of Sciences, one of the practical results of the discovery was exhibited, the writer being fortunate in seeing it. It was a simple iron clasp, that had been placed in the spring for several hours, and when exhibited it was covered with a rich white coating resembling frost; so that the most commonplace articles can be placed in this natural bath, and in a few hours taken out resplendent in the frost-like coating.

The idea was so valuable that it is said that steps are being taken to secure the right from the government of placing rude statues formed of lead in this bath, where a few hours later they would resemble marble. In this way *quasi* marble statues can be produced at an extremely small cost. An iron or tin figure of a man placed in one of these springs becomes covered in three hours; a longer time would perhaps hurt the outlines of the figure, but experiment shows that it is a quite valuable discovery. We need not go to the Western country, however, to find these curious effects. The accompanying cut shows an interesting home-made method of natural decoration.

It consists simply in taking a glass or goblet, and placing in the interior a little common salt and water. In a day or so a slight mist will be seen upon the glass—hourly this will grow, until in a very short time the glass will present the appearance shown in the accompanying illustration, the glass being enlarged to twice its thickness and covered with beautiful salt crystals, packed upon one another exactly like some peculiar fungus or animal growth. It is necessary to place a dish beneath the glass, as the crystals will run over, if the term can be used.

The glass can be made additionally beautiful by placing in the salt and water some common red ink; this will be absorbed, as it were, and the white surface covered with a rich red coat, which in turn can be covered by blue or any color by the introduction of inks or tints. No more simple method of producing inexpensive and beautiful ornaments can be imagined, and by using different shapes of vases and shapes, an endless variety of beautiful forms can be produced, pleasing alike to young and old.



SALT IN ORNAMENTATION.

Stopping Hiccough.

A Brazilian physician, Dr. Ramos (*Bull. Gen. de Therap.*), states that refrigeration of the lobe of the ear will stop hiccough, whatever its cause may be. Very slight refrigeration will answer, the application of cold water or even saliva being sufficient.—*N. Y. Medical Journal.*

Poultry Blood as a Delicacy.

A correspondent of the London *Live Stock Journal* says: There is an item in poultry keeping that seems entirely lost in this country, and that is the blood from poultry of all kinds. I have often asked the question of poultry keepers that I have come in contact with, "What do you do with the blood?" and the answer always is, "Let it run down the sink."

Now on the Continent it is considered a great delicacy (and so it is if properly cooked), as it makes an excellent dish for the table. It somewhat resembles stewed kidney, only far more delicate in taste. Several people that I have mentioned it to seemed horrified at the idea, but I hope those of my brother poultry keepers who have not heard of it before, and wasted such a profitable item, will try and give their experience through the medium of your valuable journal to encourage those that may feel prejudiced against the use of poultry blood in a healthy state.

Mode of cooking: Put a piece of butter about the size of a walnut (for the blood from one fowl) into a frying pan on a slow fire. When melted, throw in a chopped onion, and stir it about until nicely browned. Be careful not to burn it. Having previously cut up the blood into squares about the size of dice, and rolled it in dry flour, throw it into the pan with the onion and butter, and stir altogether until done. It will not be long before it is ready. Serve up hot; salt to taste.

Fat or Wax Obtained from Cinchona Barks.

From the cuprea barks the author obtains cupreol, a compound which in all points resembles a quebrachol. It crystallizes from alcohol in colorless satiny leaflets, which quickly become dull in dry air. It is readily soluble in chloroform, ether, and hot alcohol; less readily in petroleum ether and cold alcohol; and in water, ammonia, and potash lye not at all. It melts at 140°, and at higher temperatures it volatilizes unchanged in a current of hydrogen or carbonic acid. The solution in chloroform, when shaken with sulphuric acid of 1·76 sp. gr., turns a blood red, as do the chloroform solutions of quebrachol, cholesterin, or phytosterin. Cinchol occurs in all true cinchona barks, but not in cuprea bark. From hot alcohol it crystallizes partly in long, almost acicular, leaflets, partly in broad leaves, and always with 1 mol. of water. It loses a part of its water at 20° to 25°, and the rest at 100° or in the exsiccator. Anhydrous cinchol melts at 139°, and in other respects possesses the same properties as cuprol.—*O. Hesse.*

Hope as a Remedial Measure.

BY "OLD FOGY," M D.

It is very hard to restrain an irrepressible old fogy, but somehow we trust our young friends in the profession may be able to tolerate us. We do not trust ourselves on the new and refined pharmaceuticals, but our last dissertations in the *Clinic*, on remedies, have been confined to castor oil and spirits of turpentine respectively, and in this issue we have selected even a less dangerous article than the two last mentioned.

It is perfectly useless for us to attempt to portray the influence that "hope" exerts upon mankind. It is a proverbial fact that a man without hope in the fight for life is already half whipped. The sick man without hope is desperately ill indeed, however slight his physical ailment may be. It is equally as true that there is a very slight chance for the undertaker to be benefited in the case of a patient who has no disposition or idea of dying. The whole system, digestive, circulatory, and nervous, is directly under the influence of the mind; and if we will ever bear this in mind in treating our cases, we will often have a more potent remedy, easy of administration and more pleasant to give and take, than anything found in the country doctor's saddle bags or upon the shelves of our metropolitan pharmacists. Bad news, grief, or sudden disappointment has been known to reduce the circulation to a minimum, to cause a strong man to become as helpless as a child, and to arrest the process of digestion and assimilation as suddenly as if the patient's throat had been cut. Just the reverse of this may be observed under the influence of pleasant emotions and the life-giving power of bright, heaven-born hope.

Old fogy will not tell his little story without concluding it with a moral. My young friends, never enter a sick room unless your countenance, manner, and words are such as to cheer and comfort your patients. However slight their hope may be, make use of that little, encourage and stimulate them to exercise that fortitude coupled with reasonable hope which has tided and will tide many a patient over dangerous shoals where medicine would have been utterly ineffective. Again, young friends, remember that with castor oil, turpentine, and cheerful hearts you can do a power of good and very little harm.—*Southern Clinic.*

An Ironclad After Ten Years.

The Chilian ironclad Blanco Encalada, which took part with the sister ship, Almirante Cochrane, in the capture of the Huascar, completing her surrender by a terrible raking broadside, was docked on Wednesday at Hebburn-on-Tyne, in the graving dock of Mr. Leslie, shipbuilder. Much interest was attached to the circumstance on account of the ship not having been docked since she left England more than ten years ago. The iron bottom of the hull had been then covered with teak plank, fastened with iron fastenings, and sheathed with zinc sheets, in the hope that this arrangement would keep the underwater part of the ship fairly clean and free from decay. Early on Thursday morning the Blanco Encalada was visited at Hebburn by Sir Edward Reed, member of Parliament, under whose care she was originally built and is now being refitted and rearmed, and with him was Admiral Latorre, who fought the action with the Huascar; Captain Montt, who now commands the ship; Mr. W. H. White, of the firm of Sir William Armstrong & Co.; Mr. Leslie, representative of Messrs. Penn, the engineers; and numerous other persons. It is worthy of record that the bottom was found remarkably clean, notwithstanding its ten years' immersion, and that the waste of the zinc sheathing was scarcely as much as had been anticipated. No evidences of any injury to the iron plating of the ship's bottom, which was examined in places, could be detected. The experiment of the zinc sheathing upon a single layer of wood was thus found to have been more successful than could have been hoped.—*London Times.*

THE attempts to introduce the American brook trout (*Salmo fontinalis*) into English waters have not been attended with success. During the last ten or twelve years thousands of fry have at various times been turned into different waters, but in no instance has the fish really been established. Occasionally a specimen is taken here and there, but as years go by there is no perceptible increase, while in some waters, which were liberally stocked, they have disappeared altogether.

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Recent Legal Decisions.

Insolvent Partnership—Liability of Retiring Member.—Unless upon proof of fraud, the retiring member of a partnership that subsequently became insolvent cannot be held liable for any firm debts contracted after his retirement, according to the decision of the Supreme Court of the United States in the case of Penn National Bank *vs.* Furness.

Negligence—Survival of Action.—A cause of action given by statute to the personal representatives of a deceased person to recover damages for the negligent killing of such person after the death of the wrongdoer, cannot be continued against his representatives, according to the decision of the New York Court of Appeals in the case of Hegerich *vs.* Keddie.

Expert Evidence—Use of Medical Books.—In an action to recover damages for personal injuries a medical book, although shown to be a standard authority, is inadmissible in evidence to prove the nature of the injuries sustained by the plaintiff and their probable effect, though books referred to by a medical expert, to sustain the opinions which he has expressed, may be admitted in evidence to contradict or discredit him. So held by the Supreme Court of California in the case of Gallagher *vs.* Market Street Railroad Company.

Fraud on Bank—Liability of United States.—Where by the connivance of a clerk in the office of an Assistant Treasurer of the United States a person unlawfully obtains from that office money belonging to the United States, and to replace it pays to the clerk money which he obtains by fraud from a bank, the clerk having no knowledge of the means by which the latter's money was obtained, the United States is not liable to refund the money to the bank, according to the decision of the United States Supreme Court in the case of the State National Bank of Boston *vs.* The United States.

Insurance Policy—Change of Beneficiary by Will.—In the case of Wilmaster *vs.* The Continental Life Insurance Company, decided by the Supreme Court of Iowa, it appeared that the insurance company issued to Wilmaster a policy on his life, by which it agreed in consideration of the payment by him of certain premiums during his lifetime to pay to his daughter the sum of $1,300. Wilmaster paid the premiums as agreed, but at his death left a will by which he bequeathed to his daughter the sum of $500, on condition that she would assign to his estate her interest in the policy, and directed his executor, if she refused, to claim the amount of the policy. His daughter refused to assign her interest, and the executor sued the company. The court held that the company was bound to pay the money to Wilmaster's daughter under the policy; that Wilmaster could not alter the contract, and that the executor was not entitled to recover.

Mining Partnerships—Assignment of One Partner's Share.—There is no relation of trust or confidence between mining partners which is violated by the sale and assignment by one partner to a stranger or to one of the associates of his share in the property and business of the association, according to the decision of the Supreme Court of the United States in the case of Bissell *vs.* Foss. The court adopted the language of Mr. Justice Field in an earlier case before the same court, in which he said: "Associations for working mines are generally composed of a greater number of persons than ordinary trading partnerships; and it was early seen that the continuous working of a mine, which is essential to its successful development, would be impossible, or at least attended with great difficulties, if an association was to be dissolved by the death or bankruptcy of one of its members or the assignment of his interest. A different rule from that which governs the relations of members of a trading partnership to each other was therefore recognized as applicable to the relations to each other of members of a mining association. The *delectus personæ*, which is essential to constitute an ordinary partnership, has no place in these mining associations."

Railroad Conductors' Liability—Stolen Goods.—A railroad conductor who permits a passenger to travel on his train, taking with him goods known by the conductor to be stolen, is not liable to an action therefor by the owner of the goods, according to the decision of the Supreme Court of Maine in the case of Randlette *vs.* Judkins. The court, in giving judgment, said: "The railroad is a public highway, over which all members of the public who are in a proper condition to travel in a public car, who pay the established fare, and conduct themselves properly, have a legal right to travel with luggage. It is the legal duty of the conductor to permit all such persons to enter the cars and travel over the road. For sufficient cause he may stop the train and eject a traveler from the train. He owes no legal duty to the public to stop his train and eject a traveler who is guilty of a felony, or to arrest such traveler and hold him as a prisoner and seize the property he may have in his possession. As a citizen he may have the right, if he sees fit, to arrest a traveler guilty of a felony and hold him till he can be properly prosecuted; but not being an officer charged with the duty, and having no legal warrant therefor, he is under no legal duty to do so, and thereby take upon himself the burden and hazard of justifying his act. Nor does he owe any duty to any member of the public to arrest a thief, and seize and hold the stolen property he may have in his possession; or to seize and hold for the owner, whoever he may be, goods which a traveler on the road may have taken and is carrying away as a trespasser." The court added: "We have discussed the question involved upon principle, there being no authorities directly in point cited by the learned counsel on either side, and it is said there are none."—*Bradstreet's.*

A Universal Commercial Language.

The idea of creating a universal language for international relations has gained much ground during the last thirty years, in France as well as in Germany and Austria. Notwithstanding that linguists call in question the possibility of composing an artificial language that shall have a real value, and that *litterateurs* deny the opportuneness thereof, practical minds justly say that we are living in the age of steam and electricity, in which new needs are rising every day, and in which the impossibility of to-day becomes the wonderful reality of to-morrow.

No one, however, thinks longer of adopting or creating a language that is to become one day, like the Greek of antiquity or the Latin of the middle ages, the universal organ of science and letters; that is a dream that has long been abandoned. But, since diplomats have a universal or common language for their international reports, why cannot our travelers and business men have an advantageous means of communication that shall be both simple and practical, and that shall permit them to enter into direct relations with all commercial houses, in Europe as well as in all other parts of the world?

Let but a universal language exist, and the traveler will be able to make himself understood in the most diverse countries, and the same commercial journal can be read and understood in all the producing or consuming centers of the world.

As for adopting a European language as a universal idiom, there are two strong objections to it, viz., national rivalry, and the difficulties of every nature that the very study of these languages presents. As was recently remarked by Gen. Faidherbe, in a study upon the programme of the French Alliance, the complications of the verb alone often prevent colonial populations from learning a European language.

The first attempts in the way of the creation of an artificial, universal tongue date back to Descartes and Leibnitz. Much science and patience has been exhausted in the study of this question, and yet it would be difficult, among the fifty or sixty systems that have been devised in the course of the last two centuries, to find a single one that has any practical value.

A polyglot foreigner, Mr. Schleyer, of the island of Mainau in Lake Constance, has, however, finally succeeded, after twenty years' study, in finding a solution of this difficult problem in the creation of a system which he calls *Volapük* or "Universal Language."

By borrowing from the different idioms of Europe certain characteristic traits, Mr. Schleyer has combined a well-arranged, very harmonious, and extremely simple language. For the roots of his words he has had recourse to all the languages of Europe, but principally to the Romance and Teutonic ones, and among the latter to the English especially.

Although Mr. Schleyer's publications date back scarcely to 1881, the adepts in Volapük are to-day counted by thousands in the different states of Europe. Fifty-three societies have been organized for the purpose of favoring its propagation, and this, too, not only in Germany, but also in Austria, Holland, Sweden, England, the United States, and even in Syria.

Any one who understands a Romance or Teutonic language can easily learn Volapük in a couple of months. The grammar is very simple. All nouns are masculine, save those that denote the names of females. Very simple rules allow the verb and adjective to be derived from the same noun. Every adjective terminates in *ik: nul*, 'novelty,' *nulik*, 'new.'

There is but one declension, and the conjugation of the verbs is of the simplest character.

In order to give some idea of what the language looks like, we present the Lord's Prayer in Volapük, with an interlinear translation:

Fat	*obsik,*	*kel*	*binol*	*in*	*süls,*	*mem*	*olik*
Father	our,	who	art	in	heaven,	name	thy
pasanukomös;		*kinän*	*olik*	*nakokomös;*		*vil*	
be (it) sanctified;		kingdom	thy	let (it) come;		will	
olik	*jenomös*	*su*	*tal*	*äslik*	*in*	*sül;*	*givolös*	*obes*
thy	be (it) done	upon	earth	as	in	heaven;	give	us
tudel	*bodi*	*obsik*	*delik,*	*e*	*fogivolös*	*obes*	*nofis*
to-day	bread	our	daily,	and	forgive	us	sins
nobis	*äslik*	*fogivobs*	*utes*	*kels*	*enofoms*	*obis;*	
our	as	forgive we	those	who	sin against	us;	
e	*no*	*letolös*	*obis*	*pabevikodön*	*fa*	*tenüd,*	
and	not	let	us	to be conquered	by	temptation,	
sod	*delivolös*	*obis*	*de*	*bad.*	*Jenosöd.*		
but	deliver	us	from	evil.	So be it.		

The Article is wanting in Volapük.

The Noun is declined. For example, take the word *dom*, 'house':

Nom. *dom*, the house.
Gen. *doma*, of the house.
Dat. *dome*, to the house.
Accus. *domi*, house.

The plural is formed by the addition of *s* to the above cases.

The Adjective.—As before remarked, adjectives are formed by adding *ik* to the root. For example, *dom*, 'house,' *domik*, 'domestic.'

The Adverb is formed from the adjective by adding *o*. For example, *domik*, 'domestic,' *domiko*, 'domestically.'

The Pronouns are *ob*, 'I,' *ol*, 'thou,' *om*, 'he,' *of*, 'she.' Adding *s* for the plural, we have *obs*, 'we,' *ols*, 'you,' *oms*, 'they' (masc.), *ofs*, 'they' (fem.). The possessive case is formed by adding *ik: obik*, 'mine,' *olik*, 'thine,' *obsik*, 'our' (sing.), *obiks*, 'our' (pl.).

The Verb.—The verbs are derived from the substantive. Knowing the word *pük*, 'tongue,' we derive from it the verb *pükon*, 'to speak.' For the different persons we add the various pronouns to the radical *pük*. For example, *pükob*, 'I speak,' *pükol*, 'thou speakest,' *pükom*, 'he speaks,' *pükobs*, 'we speak,' *pükols*, 'you speak,' *pükoms*, 'they speak.'

Tenses are formed by the augmentatives or prefixes *a, e, i, o, u*. For example, *pükob*, 'I speak,' *apükob*, 'I was speaking,' *epükob*, 'I have spoken,' *ipükob*, 'I had spoken,' *opükob*, 'I shall speak,' *upükob*, 'I shall have spoken.'

From this it will be seen that the grammar is, as before remarked, exceedingly simple.

Numerous works have been composed for the study of this universal language. Along with his grammar, Mr. Schleyer has published a Volapük-German dictionary containing nearly 13,000 words, and both works are now in their fourth edition. Abridged editions of the grammar have been published in Latin and all the languages of Europe, and also in Chinese and in Nama, the dialect of the Hottentots. Dictionaries for the use of the French, English, Italians, Dutch, and Hungarians are being prepared, and will soon appear.

Two reviews are likewise published in Volapuk—one, the *Volapükbled*, with a translation opposite, and the other, the *Volapükaklubs*, entirely in Volapük.

On the occasion of the Universal Exposition in 1889, an international congress of Volapukists will be held at Paris.

Merulius Lacrimans—the Dry Rot.

A short time before his death, Prof. H. R. Goppert, of Breslau, in connection with the chemist Professor Poleck, made a study of the hausschwamm—a fungus commonly known with us as dry rot, which had caused great injury to buildings in northern Germany. The results of their combined studies now appear in a pamphlet by Professor Poleck ("Der Hausschwamm," Breslau, 1885). The dry rot, Merulius lacrimans, seems to be unknown in a wild state in Germany, but is confined to woodwork of different kinds, and attacks by preference coniferous timber. Strange to say, the fungus does not usually infest old structures, but generally makes its appearance in comparatively new buildings; and a startling series of figures shows the amount of damage done in the region of Breslau. Chemical analyses by Poleck show that the merulius is particularly rich in nitrogenous compounds and fat, which is rather remarkable, when one considers the chemical constituents of the timber on which it grows. Injury to health, or even death, is said to result from exposure to air containing large quantities of the spores of the merulius; and several authenticated cases are reported. In a supplementary note, Poleck considers the relationship of merulius to actinomyces, a fungus which causes a characteristic disease in man and cattle; and he apparently comes to the conclusion that what is called actinomyces is probably only the merulius altered by the peculiar matrix on which it is growing. His statements on this point can hardly be called conclusive, or, in fact, other than vague.

A New Application of Electricity.

We recently printed an article on this subject concerning Mr. Walker's application of the discoveries of Professor Lodge and Professor Clark to the condensation of lead fume and other volatilizations met with in metallurgical works. A German contemporary, the *Berg- und Huttenmannische Zeitung*, also published an article on the subject, which has called forth a letter in the issue of the paper of July 10 from B. Rosing, of Tarnowitz, stating that the original discovery of this action of electricity on dust is not by any means recent. It was known in 1850, when Guitard published his observations as to rapid condensation of tobacco smoke in a glass, by introducing into the glass one of the wires from an electrical machine. The writer of the letter also mentions Wiedemann's work on electricity, *Lehre von der Electricitat*, as referring to this in vol. i., page 33. Although the discovery thus appears to be old enough, there does not seem, says *Engineering*, to have been any practical application of it till Mr. Walker took it up.

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Medals at the Inventions Exhibition, London.

The crop of medals harvested by Americans at the Inventions Exhibition in London was not a very abundant one. There was some complaint that the exhibits made by our countrymen were much smaller than had been expected, and this may account for the limited awards which they have received. In proportion, however, to the number competing, the results are not unfavorable. The four gold medals awarded to American exhibitors were as follows :

Adamson, Daniel & Co., "Wheelock" automatic cut-off engine.

Edison and Swan United Electric Light Company (Limited), Edison-Swan systems of electric lighting.

Thomson and Houston systems of electric lighting (exhibited by Laing, Wharton & Down).

Westinghouse Brake Company (Limited), automatic air brake and passenger communication for railway trains.

Two silver medals were awarded:

Delany Synchronous Multiplex Telegraph System, multiplex telegraphy.

Maxim-Weston Electric Light Co., electrical exhibit.

Bronze medals were also received by two exhibitors:

Anglo-American Brush Electric Light Corporation (Limited), electric lighting apparatus.

Van der Weyde, electrical illumination of the sitter in photographic portraiture.

It will be noticed that of the eight awards, six are for electrical apparatus, well illustrating the prominence given in America to electrical study.

Hints for the Workshop.

The following suggestions, to which hundreds of others might be added, are taken from the *Manufacturers' Gazette:*

Clean and oil leather belts without taking them off of their pulleys. If taken off, they will shrink. Then a piece must be put into them and removed again after the belt has run a few days.

The decay of stone, either in buildings or monuments, may be arrested by heating and treating with paraffine mixed with a little creosote. A common "paint burner" may be used to heat the stone.

Set an engine upon three or four movable points, as upon three cannon balls. Connect with steam, and exhaust by means of rubber hose. If the engine will run up to speed without moving itself back and forth, then that engine will run a long time with little repair. If it shakes itself around the room, then buy another engine.

Safely moving a tall mill chimney has been accomplished several times. Chimneys which have been caused to lean slightly through settling of the foundation may be straightened up again by sawing out the mortar between courses of brick at the base. A chimney 100 feet high and 12 feet square at the base will be varied over 8 inches at the top by the removal of 1 inch at the base.

When you begin to fix up the mill for cold weather, don't forget to put a steam trap in each and every steam pipe which can be opened into the atmosphere for heating purposes.

For leading steam joints, mix the red lead or litharge with common commercial glycerine instead of linseed oil.

Put a little carbolic acid in your glue or paste pot. It will keep the contents sweet for a long time.

Look well to the bearings of your shafting, engine, and machines. Sometimes twenty-five, thirty, forty, and even fifty per cent of your power is consumed through lack of good oil.

When you buy a water wheel, be sure to buy one small enough to run at full gate while the stream is low during the summer months. If you want more power than the small wheel will give, then put in two or more wheels of various sizes.

When it becomes necessary to trim a piece of rubber, it will be found that the knife will cut much more readily if dipped in water.

When forging a chisel or other cutting tool, never upset the end of the tool. If necessary cut it off, but don't try to force it back into a good cutting edge.

In tubular boilers the handholes should be often opened, and all collections removed from over the fire. When boilers are fed in front, and are blown off through the same pipe, the collection of mud or sediment in the rear end should be often removed.

Nearly all smoke may be consumed without special apparatus, by attending with a little common sense to a few simple rules. Suppose we have a battery of boilers, and "soft coal" is the fuel. Go to the first boiler, shut the damper nearly up, and fire up one-half of the furnace, close the door, open damper, and go to the next boiler and repeat the firing. By this method, nearly if not quite all the smoke will be consumed.

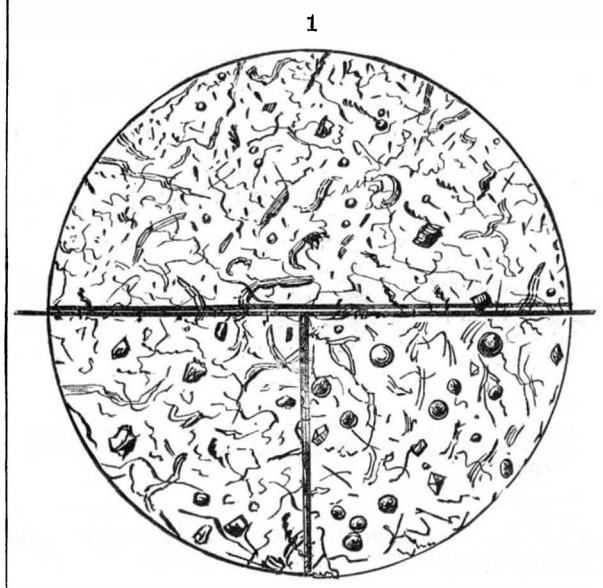
A coiled spring inserted between engine and machinery is highly beneficial where extreme regularity of power is required. It is well known that a steam engine, in order to govern itself, must run too fast and too slow in order to close or open its valves, hence an irregularity of power is unavoidable.

THE MICROSCOPE IN THE MECHANIC ARTS.

BY GEO. M. HOPKINS.

It is said that a workman may be known by his chips, and the same test of workmanship may be applied to an emery wheel; there is no truer index of the character and efficiency of an emery wheel than the microscopic dust which is projected from its periphery while it is in use.

An examination of this dust by the aid of a microscope shows whether the wheel is doing its work without undue waste of its substance; also whether the constituents of the wheel are disproportioned, to the extent of using too great a proportion of cement to bind the particles of emery together, or whether the cement employed for this purpose is weak and inefficient. An emery wheel is nothing more or less than a rotary cutter, whose cutting edges are composed of emery or corundum, and of course the efficiency and the durability of the wheel depend upon the manner in which these cutters are held. Each cutter must have a setting sufficient to hold it while it is doing its work. If this setting is too weak, or in other words, if the cement employed in making the wheel lacks strength and tenacity, the cutters will be readily loosened and lost; but while the wheel will be rapidly disintegrated, it will cut freely, and in this respect has the advantage over a wheel formed with an excess of cement, which completely envelops the cutter, or the particle or crystal of corundum or emery, and thereby



MAGNIFIED EMERY WHEEL DUST.

prevents the material being ground from being brought into contact with the cutting edges without undue pressure. The characteristics of a wheel of this kind are the rapid glazing of the surface and the slowness of its cutting.

The microscope reveals exactly what the character of the emery wheel is; whether it is composed of too great a proportion of cement, whether it is made up of materials other than emery and cement, whether it is friable and liable to rapid disintegration. An examination of the dust projected from the periphery of the emery wheel will show whether there is too great a proportion of cement employed in its manufacture; it will show whether the wheel is cutting freely; it will also indicate whether too great a pressure is required to cause the wheel to cut as rapidly as it should.

If an examination of the emery wheel dust reveals mainly fibers of iron or steel cleanly cut, with very few grains or crystals of corundum or emery, and if few fused globules of steel or iron are present, it may be concluded that the emery wheel is of a good quality, and is doing its work properly; but if such an examination shows a large proportion of the grains of emery, it indicates, of course, that the wheel is becoming rapidly disintegrated. If, on the other hand, steel and no emery is found in the wheel dust, if the iron or steel fibers are partly fused, and if the number of globules of melted steel or iron is great, we may conclude that the wheel is one that is liable to glaze, and requires too great a pressure to work upon it.

Fig. 1 shows the dust of a first-class wheel magnified about sixteen diameters. It will be noticed that there are comparatively few angular grains or particles of emery, while the iron or steel chips cut from the work by the wheel are long and clean, and carry the evidences of having been done with a good cutter.

Fig. 2 shows the dust from an emery wheel which contains a large proportion of emery, and either a small amount of cementing material, or cement of poor quality; and while the iron or steel chips appear equally as well as in the other case, the wheel in this case is being rapidly destroyed.

Fig. 3 shows the dust from a wheel having too great a proportion of cement, and exhibiting a tendency to glaze; the great pressure required to make the wheel cut also generates a heat which is sufficient to fuse the particles of iron or steel as they are separated from the main body of the object being ground.

Photo Emulsions Spoiled by Thunder.

The most noticeable effect of thunder upon gelatinous solutions or on emulsion is, says the *Photo. News*, to bring about a certain decomposition, which interferes, more or less, with the setting properties of the gelatine; and if the solution be kept, it quickly becomes putrid. In some extreme cases the emulsion refuses to set altogether; in others, where the injurious effect is less marked, it does set, but tardily, and then, although the plates may turn out otherwise good, they generally frill or blister to such an extent, during the fixing and washing, as to render them next to worthless. What is the actual effect, chemically, of thunder upon gelatinous solutions, at present is very doubtful. Whatever the effect may be, the cause by some is attributed to the presence of ozone, which usually accompanies violent electric disturbances in the atmosphere. But ozone will scarcely account for all the injurious changes wrought by thunder upon substances which are similarly affected to gelatine. For example, it is no unusual circumstance for ale which is stored in air-tight casks in underground cellars to be rendered both turbid and sour by a thunderstorm; and we have known an emulsion while in a closed vessel being spoilt from a similar cause. It is difficult to conceive, under these circumstances, how ozone can possibly be the cause.

Curiously enough antiseptics, which, under ordinary condition, prevent decomposition in gelatine, appear to have little or no influence in the case of thunder. It is worthy of note that thunder appears to exert little or no influence upon cold or jellied emulsions, neither has it upon concentrated solutions of gelatine, even when they are in a fluid condition. Therefore, as a piece of practical advice, we suggest that when electrical disturbances of the atmosphere are apprehended, precaution be taken that all emulsions be got into the jellied condition as quickly as possible. Also to bear in mind that it is during the emulsification, with the small proportion of gelatine, that the injury is most likely to arise.

It is a curious fact, but not the less true, that a severe storm may sometimes occur without causing the slightest inconvenience, while, on another occasion, the conditions being apparently identical, a very slight one, even a single clap of thunder, will cause an immense amount of trouble. In all cases it is wise, when possible, to defer preparing emulsions, particularly on a large scale, when violent electrical disturbances of the atmosphere are anticipated.

A Tornado in Ohio.

About 8 o'clock, on the evening of September 8, the town of Washington Court House, the county seat of Fayette County, Ohio, about fifty miles northwest of Cincinnati, was struck by a tornado, which destroyed a great part of the place. More than fifty of the principal stores and business buildings were ruined, besides the damage of many others, the loss upon buildings alone being computed at from half a million to a million dollars. The duration of the tornado is said to have been about two minutes, but this is probably largely conjectural, although it lasted long enough to destroy some brick and many wooden buildings, killing several and wounding a large number, and giving the place in the track of the storm the appearance of a total wreck, all in so short a time that the terrified people could hardly realize what was happening. One family of five, living six miles west of Washington, when the storm first struck took refuge in the cellar, just in time to see their house lifted above them and hurled through the air a distance of 250 feet. There were meetings being held in Music and in Odd Fellows' Hall, and they were both so ruined that it was wonderful how so many escaped. The northeastern and southwestern portions of the town were not much damaged. The tornado is described as having had the appearance of an immense rolling ball of cloud, illuminated with electricity.

Success of Aluminum Smelting by Electricity.

Among the valuable metals peculiarly adapted for use in the mechanical and fine arts may be mentioned aluminum, hitherto utilized only to a limited extent because of its refractory qualities and the expense encountered in its reduction.

For articles requiring great tensile strength and resistance, aluminum bronze may be considered the foremost, reaching 100,000 pounds per square inch; is susceptible of being tempered, and of receiving a high degree of finish.

By the process of "smelting ores by the electric current," recently patented by the Messrs. Cowles, of Cleveland, Ohio, the expense is so materially reduced that aluminum and its alloys will enter largely into the various branches of mechanical industry, to the exclusion of inferior metals; and the beautiful gold, silver, and bronze colors render it exceedingly valuable and desirable for small ornaments, statues, and all art metal work, and the remarkably low price at which this aluminum bronze is now produced insures for it a widespread employment in the arts.

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AGRICULTURAL INVENTIONS.

A combined harrow, cultivator, and plow has been patented by Mr. Solomon Franklin, of Pine Bluff, Ark. It is made with inclined tubular side bars having cultivator-teeth and connected by arched cross bars with standards carrying adjustable plows, with other novel features, for pulverizing the soil and throwing it to or from the plants, and to regulate the depths to which the teeth and plows enter.

MISCELLANEOUS INVENTIONS.

A gate has been patented by Mr. John G. Wilson, of Cameron, Texas. This invention covers a novel construction and arrangement of parts for a farm gate which can be opened from either side by a person on horseback or in a vehicle, or by a pedestrian.

A type writing machine has been patented by Mr. Edward R. Roe, of Dixon, Ill. A type disk and index circle and indicator are used, but the object of the invention is to simplify the construction and arrange the parts to operate more rapidly.

A hoisting and lowering apparatus has been patented by Mr. Isaac I. Lancaster, of Tacoma, Washington Ter. This invention relates to apparatus for hoisting and lowering objects with a windlass and jack, consisting in a novel arrangement of springs which actuate the pawls in various uses of the machine.

A watch case has been patented by Mr. Victor Nivois, of New York city. This invention consists in setting jewels in the cap plate of the watch case and protecting them with the back plate of the case, the back plate having openings formed in it to reveal the jewels.

The sinking of hydraulic piles forms the subject of a patent issued to Mr. Lowell E. Blake, of El Paso, Texas. This invention covers the use of a jet of water supplied at the entering point of the pile, in connection with a weight at its upper end, for the sinking of wooden or other piles in quicksand, etc.

A step ladder has been patented by Mr. Wright Pearson, of Jamestown, N. Y. It is of novel construction in several important features, and has a hand rail whereby one can steady himself, and so a paint vessel or tool box can be conveniently held to facilitate any kind of overhead work.

A feed rack has been patented by Mr. Benjamin F. Waggoner, of Litchfield, Ill. It is for feeding hay and other fodder to stock, and is so made as to prevent the fodder from being wasted and prevent hogs from having access thereto, while it can be readily moved from place to place.

A music stool has been patented by Mr. George A. Ramseyer, of Dobbs Ferry, N. Y. It is so made as to be used with or without a back, and so that when the back is folded down it does not interfere with the ordinary use of the stool, and the stool may then be packed in small space for shipment.

A fishpond trunk has been patented by Mr. William S. Mallard, of Darien, Ga. It is so devised that the overflow water of a pond may be used to operate a waterwheel, or to pass off without working the wheel, but in either case the escape of the fish from the pond will be prevented.

A clothes line support has been patented by Mr. William C. Young, of Paterson, N. J. The device is to be hung by its roller end on the upper part of the clothes line, keeping the two parts of the line at a uniform distance apart, supporting the lower line from the upper, while the supporters will not run together and against the clothes.

An adjustable mirror bracket has been patented by Mr. John J. Langdon, of South Pueblo, Col. This invention covers a special combination of parts and details whereby a mirror can be easily adjusted higher or lower according to the size of the person, and can be inclined laterally and to the horizontal plane.

A kitchen safe and flour chest has been patented by Mr. William Knowles, of Rockville, Ind. It has two flour chests wtih inclined bottoms and screen, a conveniently arranged dough board, receptacles for seasoning materials, a box for holding bread, all specially arranged to promote convenience in usual kitchen or household use.

A spring armored hose pipe has been patented by Mr. Joseph A. Coultaus, of Brooklyn, N. Y. This invention consists in spiral armor formed of spring steel wire, the internal diameter of the spiral being smaller than the external diameter of the pipe, so the coils form a spiral spring that binds closely at every portion of its length.

A saw swaging device has been patented by Mr. Henry Williamson, of Bay City, Mich. Combined with a box is a device for gripping the saw teeth, and a shaft on which a die is formed for swaging the teeth, the device being simple in construction, strong, and durable, and one which can be used on gang or circular saws.

A hacker for chipping pine trees has been patented by Mr. Randolph M. Barron, of Castleberry, Ala. The cutting head is of the usual loop form, but instead of being made all in one piece is of sectional construction, having a separate bit piece to enter within the body part and held adjustably in place, so the tool can be used a long time by just changing the bits.

A shovel fastener for cultivators has been patented by Mr. George W. Lilly, of Center, Mo. The shank of the standard has a longitudinal rib or elongated cog, in combination with a novel construction of fastener with grooves to fit said rib or cog, so the shovel may be adjusted to occupy different positions laterally and also different depths.

A drilling apparatus has been patented by Mr. John Hunter, of Kingston, Ont., Canada. Its construction is such that the tension or friction can be made light enough to run small drills, such as are usually operated by bows, or it can be adapted for heavy work, being calculated for all the ordinary work of watchmakers and jewelers.

A process of uniting gold and vulcanite has been patented by Mr. Jehu H. Wood, of Lebanon, O. It consists essentially in the application of a solution of chloride of silver to the plastic gutta percha or rubber prior to the application of the gold and to the vulcanization of the mass, whereby a union is made between gold and vulcanite.

A chain saw has been patented by Mr. Walter S. Shipe, of Minerva, O. It is composed of single and double links jointed together by shouldered rivets, the links fitted with cutters dovetailed to pass between lugs on the side of the links, the cutters forming cutting and clearing teeth, and the machine being adapted for felling trees and cutting logs.

A support for rock drills has been patented by Mr. George W. Nixon, of Rockwood, Tenn. This invention provides a base against which a drill propelled by a ratchet lever or similar device may push to force itself into the rock, and means whereby the ratchet drill may be quickly readjusted after it has extended to its limit.

A mosquito net frame has been patented by Mr. Thomas A. Watson, of Houston, Texas. Combined with two side posts having pivots are horizontal arms working thereon, a bar connecting the tops of the posts and an extensible bar connecting the arm ends, so the net may be easily swung over a bed or folded back out of the way.

A door opener has been patented by Mr. Charles E. Whitney, of Brooklyn, N. Y. It is made with a slot in the striker to receive a pin on a gear wheel, which is operated by a rack bar and spring, whereby the striker will be locked in place by the pin, and the striker cannot be forced back from the outside while the door opener is easily operated.

An emery and sandpaper machine for dressing leather has been patented by Mr. Frederick H. Meyers, of Philadelphia, Pa. Combined with an abrading wheel is a pivoted lever and devices for moving it toward the wheel, with a cushioned support on the lever, so the leather will give more or less, and not be heated or burned by the wheel.

A trace holder for back bands has been patented by Mr. Alonzo Collins, of Chetopa, Kan. A recessed metal plate is riveted to the lower end of the back band, the plate having apertures, while there is a detachable hook for holding the trace chain, with a shield, a shank, and a catch, the device being adjustable to fit horses of different sizes.

A car axle box has been patented by Mr. Jesse S. Williams, of Beaver Dam, Ky. In combination with the axle is a journal box with a chamber for holding a lubricant, and an interior cap block so fitted as to close the outlet of the chamber and bear on the rotating axle, being opened by the jar of travel to permit the flow of the lubricant to the axle.

A combination lock has been patented by Messrs. Thomas H. Cole, of East Albany, and Charles McCarrick, of Tivoli, N. Y. It has sliding tumblers, any suitable number of which may be used for complicating the lock, which may be of a hasp or other form, and combinations may be made very easily by moving a pin to different positions, enabling a great many changes of combinations to be made.

A thill coupling has been patented by Mr. Alverow McDowell, of Hudson, Ind. Combined with a clip having jaws is a bolt in the jaws, with caps on the ends of the bolt and having angular arms which overlap between the jaws, and are held by a screw passed through them and resting against the thill eye, making a device which is simple and strong and does not rattle.

A self-closing faucet has been patented by Mr. Andrew J. Homan, of New York city. The construction is such that when the valve is open water or other fluid will pass freely, but the fluid pressure will always act on the inside of the closed forward end or head of the valve to close it to its seat when the pressure on the button is relaxed, unless the valve is held open by a pin and cam device.

An automatic tap has been patented by Mr. Adam J. Geyer, Jr., of Rahway, N. J. It has an externally screw-threaded outer shell and a sliding inner shell, with a protecting cap or cover hinged to its head in such position that the cap is adapted to be closed over the tap when the coupling nut and pipe are removed, and a stamp may be so pasted over that the tap cannot be opened without mutilating the stamp.

A safety attachment for horned cattle has been patented by Mr. William P. Simonds, of Competine, Iowa. It consists of levers to be applied to the horns and connected to a nose ring, the levers being centrally fulcrumed upon the horns in such way that any attempt of the animal to use its horns will cause pain, and break the animal of any habit or desire to use its horns.

A cattle guard has been patented by Mr. Leslie T. Hardy, of Houston Mines, Va. This invention relates to a form of guard where rollers are arranged in bearings in the track bed of a railroad, to revolve from contact with the hoof of an animal, and so deter the latter from passing over, these rollers being hollow and having metal pieces to make a sound to frighten the animal.

A fence has been patented by Mr. John W. Read, of West Salem, Ohio. This invention covers improvements on a former patented invention of the same inventor, hangers for the lower rails being combined with the supports or posts and top rails of a fence, with other novel features, whereby the fence will stand firmly in heavy winds, and can be made, set up, and removed quickly.

An ore separator has been patented by Mr. David F. McKim, of Cable City, Montana Ter. This invention covers a novel construction and combination of parts to promote the more convenient adjustment and steadier working of the ore receiving belt, and to provide better regulation of the water supply to the belt, so as to insure the better separation and closer grrading of the ores.

A fire escape has been patented by Mr. Samuel Snyder, of White Sulphur Springs, Montana Ter. Combined with a windlass drum journaled in a frame is a rope secured thereon, a brake pulley formed on the drum, a brake band around the pulley, and a rope secured to the brake band, so the descent can be regulated by the descending person, or by one in the room or in the street.

A boiler tube cutter has been patented by Mr. George M. Odgers, of Elizabeth, N. J. The cutter stock is cylindrical and has a transverse slot to receive the cutter, with a longitudinal aperture and adjusting bar, with other novel features, to facilitate cutting out the tubes of steam boilers and promote simplicity in the construction and convenience in the use of boiler tube cutters.

A check rein holder has been patented by Mr. William D. Taber, of Rockville, R. I. It consists in a frame, a clamping device arranged to clamp the check strap in a space between itself and the frame, and the frame having a side space or slot communicating with the space in which the check strap is clamped, so a horse may be checked higher or lower, or unchecked from a single line from the vehicle.

NEW BOOKS AND PUBLICATIONS.

A SYSTEM OF IRON RAILROAD BRIDGES FOR JAPAN. By J. A. L. Waddell. Published by the Tokio University, Tokio, Japan.

Professor Waddell went to Japan some three years ago as an instructor in the University, and to attend to practical engineering work, but found there was no work in that country for foreign engineers, and he had but seven students in the engineering department. This work on bridge engineering, therefore, which has been printed by the Japanese University, is left as a sort of memorial and professional record of the author's stay in Japan. It is a most elaborate treatise, in two volumes, one being occupied by tables and plates alone, and for a large variety of bridges every detail of construction is set forth with such completeness that the bridge engineer can here find all his plans ready made.

MODERN MOULDING AND PATTERN MAKING. By Joseph P. Mullin. D. Van Nostrand, New York.

To the moulder who wishes to become a pattern maker, or to understand the more difficult work of his own department, so as to make up new and out of the way jobs intelligently, this book cannot fail to be a valuable aid. Too many moulders are only able to do simple classes of work, the same kinds of pieces with very little variation from year to year, never supposing that in learning to do this they have only acquired the rudiments of their trade. This, we are glad to say, is not the general disposition of American mechanics, but there are some who would like to push themselves forward in the more difficult parts of their business who find it no easy task to do so, from the jealousy or indifference of those who might be their teachers. This book treats of foundry work of many difficult kinds, giving practical examples, with the clear illustrations and plain description which one would expect from a workman who has had experience in all the details of the work concerning which he writes.

TOPOGRAPHICAL DRAWING. By Lieut. R. S. Smith, U. S. A., and Charles McMillan, C. E. John Wiley & Sons, New York.

This is a delightfully simple and practical book, and one which had long use, as originally written by Professor Smith, at the West Point Academy; it is now revised by Professor McMillan, of Princeton, and forms a text book admirably adapted to aid a beginner to the attainment of a high grade of excellence in field sketching, platting, plain and colored drawing, and the reducing, enlarging, and copying of maps or plans. Much of the work shown is similar to that done by the United States Coast Survey, and the plates of conventional signs and tints, with the methods given of laying on the latter, as also the numerous illustrations showing the professional usage in representing a wide variety of subjects, make the book one likely to be of lasting value to those doing such work as a profession, as well as the student.

TOPOGRAPHICAL SURVEYING BY MEANS OF THE TRANSIT AND STADIA. By J. B. Johnson. John Wiley & Sons, New York.

This book describes a system of surveying which has grown up in this country within the last twenty years, and which is conceded to be especially well adapted to preliminary work in railroad and canal surveys, drainage basins, reservoir, dam, and bridge work, and for obtaining contours of the ground over extended areas. It is written by a Professor of Civil Engineering in Washington University, but while sufficiently elementary for students, is intended to be of practical use to the engineer in the field.

Received.

EXTERIOR BALLISTICS. By Captain James M. Ingalls, Instructor, U. S. Artillery School, Fort Monroe. Published as the authorized text book of the class.

THE ELEMENTS OF RAILROADING. By Charles Paine. The *Railroad Gazette*, New York.

CHEMICAL PROBLEMS. By Karl Stammer and W. K. Hoskinson. P. Blakiston, Son & Co., Philadelphia.

Wood working machinery forms the subject of a handsome quarto catalogue, profusely illustrated, which has been recently issued by Messrs. Rowley and Hermance, of Williamsport, Pa., describing the great variety of such machines they make.

The Ferracute Machine Company, of Bridgeton, N. J., also send us an illustrated catalogue and price list of their manufacture in presses, dies, can makers' machinery, and other sheet metal tools.

The steam engines and boilers made by Messrs. Wood, Taber & Morse, at Eaton, Madison County, N. Y., are illustrated and described in a catalogue recently issued by that firm.

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Peerless Leather Belting. Best in the world for swift running and electric machines. Arny & Son, Phila.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

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For Steam and Power Pumping Machinery of Single and Duplex Pattern, embracing boiler feed, fire and low pressure pumps, independent condensing outfits, vacuum, hydraulic, artesian, and deep well pumps, air compressers, address Geo. F. Blake Mfg. Co., 44 Washington, St., Boston; 97 Liberty St., N. Y. Send for catalogue.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Cutting-off Saw and Gaining Machine, and Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Curtis Pressure Regulator and Steam Trap. See p. 12.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Iron and Steel Drop Forgings of every description. Billings & Spencer Co., Hartford, Conn.

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Safety Elevators, steam and belt power; quick and smooth. D. Frisbie & Co., Philadelphia, Pa.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 76.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

The "Improved Green Engine," Automatic Cut-off. Providence Steam Engine Co., R. I., *Sole Builders.*

Domestic Electricity. Describing all the recent inventions. Illustrated. Price, $3.00. E. & F. N. Spon, New York.

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Brass and Iron Working Machinery, Die Sinkers, and Screw Machines. Warner & Swasey, Cleveland, O.

For Sale.—Patent on Exercising Bars described in SCIENTIFIC AMERICAN of June 2, 1883. Address Geo. Worthington, 57 Second St., Baltimore, Md.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) H. W. asks: What kind of a lightning rod is the best, and whether a copper rod is better and safer than iron or steel? Also how they should be placed on the building so as to give complete protection to the house? A. A copper rod is about twice as efficient as an iron rod of the same size. Either copper or iron will answer the purpose if large enough and well grounded. Have a good point at each gable and chimney, and connect all of the metal parts of the roof with the rod. Insulators are unnecessary. For a ground connection dig a trench deep enough to reach earth that is always moist. Have the trench lead away from the house. Make it ten feet long, and put in the bottom a layer of coke or metal scraps of any kind. Place the lower end of the rod along the middle of this layer, then cover it with coke or metal scraps, and finally fill in the trench with earth.

(2) E. E. F. asks: 1. How much larger must I make a dynamo than the one in SUPPLEMENT, No. 161, to get 4 lamps, each lamp equal in candle power to an ordinary kerosene lamp? A. The dynamo described in SUPPLEMENT, No. 161, is suited only to small uses. If you desire to make a larger machine, you should make one after the more recent Siemens, Edison, or Weston plan; you will find instructions for making such dynamos in the back numbers of the SUPPLEMENT and in works on dynamo-electric machines and electric lighting. 2. I have fine oilstone which has become glassy from bad oil being used on it. How can I raise the grit so that it will not become so again? A. Soak the oilstone in naphtha or benzine for several days.

(3) J. S. K.—The simplest way to make a strong permanent magnet is to purchase several of the ordinary horseshoe magnets sold at the stores, and bind them together with like poles and contact. Permanent magnets are made by rubbing the hardened steel across the face of an electromagnet or by inclosing the polar extremities in wire helixes, and then sending a current through the helix.

(4) R. R. M.—There is nothing superior to the dipping needle for indicating the presence of iron ores. You can obtain these needles from J. W. Queen & Co., No. 924 Chestnut Street, Philadelphia, Pa. We think that the ores taken directly from the beds would be fully as likely to be magnetic as those formed on beaches.

(5) E. R. asks if there is anything that will fasten ultramarine blue in cotton goods. A. Use albumen or casein.

(6) C. H. V. asks: 1. What oil is used for keeping sodium in? What causes the explosion when in contact with water? A. Naphtha. The explosion is due to the chemical action, shown in the rapid oxidation of the sodium by the oxygen obtained from the decomposition of the water. 2. How can I cool water, milk, etc., to about 40 degrees without ice? A. Use freezing mixtures. See answer to query 4, in SCIENTIFIC AMERICAN of June 21, 1884. 3. How can power be best transmitted 1,000 feet—by wire rope, compressed air, or shafting? A. All things being equal, cable wire is probably the best.

(7) B. F. S. writes: I did not meet with success in taking off ink from common writing paper. I took nitric acid and diluted it with water, but after the ink disappeared I could not write over the same place without it disappearing also. What is deficient or lacking? A. The best substances with which to remove ink spots are a cold aqueous or acetic acid solution of calcium hypochlorite, or else solutions of bleaching powder or eau de javelle. 2. What is the best receipt for a sea foam? A.

Bay rum	2½ pints.
Water	½ "
Glycerine	1 ounce.
Tinct. of cantharides	2 drachms
Carbonate of ammonium	2 "
Borax	½ ounce.

Mix them.

(8) D. R. R.—Rule for length of arc when chord and versed sine are given: Multiply square root of sum of square of chord, and four times square of the versed sine, by ten times square of versed sine; divide this product by sum of fifteen times square of chord and thirty-three times square of versed sine; then add this quotient to twice the chord of half arc, and sum will give length of arc nearly. To obtain twice the chord of half arc, add square root of the sum of square of chord and four times square of versed sine. A great deal of information of this kind is given in Haswell's Engineer's Pocket Book, which we can send you for $4.00.

(9) R. K. asks: 1. Is there a press for ox bones, and how are they prepared for manufacture? A. They are softened by soaking in water in acids, then split and pressed between heated plates, much of the work being then stamped out by cutters. 2. How must tallow be prepared for manufacturing white candles? A. The tallow consists usually of about ⅓ beef and ⅔ mutton suet. For use in warm climates this must be hardened. Among the various methods used for this purpose, the following seems to be the simplest: Use 1 pound of alum for each 5 pounds tallow. Dissolve the alum in water, then put in the tallow and stir until both are melted together, and run into moulds.

(10) Sam asks: What can be used (and how prepared) as an inflator to the toy or silk paper balloons, besides alcohol or kerosene? A. Hydrogen, the lightest of all gases, is readily generated by treating zinc with sulphuric acid. Take a bottle, put the zinc into it, add the acid with water, and the gas will come out through the mouth. Cover the mouth with a cork, and pass a quill or tube through it. To this connect your balloon.

(11) W. H. R. writes: About 30 feet in front of my residence, which is a Queen Anne cottage, runs a telegraph line. From the poles of this line are stretched six wires at a height about level with my roof. The chimney upon my roof extends probably six feet above level of highest wires. Now, do these wires afford any protection to the property from the dangers of lightning? Some say the wires protect it, and some say not. I confess I see no reason why they should, but it is said that no house or barn was ever known to be struck by lightning near a telegraph or railroad line. What is good, full, and exhaustive treatise on lightning protection? A. We think the telegraph wires would tend to protect your house against lightning; but your house should have a system of lightning rods well grounded to furnish the best protection. You will find three books on lightning protection in the Scientific American Book List.

(12) A. W. C. asks: 1. If white is the union of the primary colors, why won't a paint mixture of those colors produce white? A. Because the colors cannot be exactly arranged in the same proportions as those in which they exist in the spectrum, and pigment colors are not pure. 2. Would ½ pound of copperas in a sink be a good disinfectant, and not injure the pipe? A. 1½ pounds copperas to the gallon of water are the proportions recommended by the National Board of Health. It will not injure the pipes. A simpler disinfectant, and one much more convenient, is common salt in similar proportions. 3. Can you furnish a formula for medicinal pancreatine? A. Saccharated pancreatine is prepared as follows: The pancreas is dissected and macerated in water acidulated with hydrochloric acid for about 48 hours, then separated, and the acidulated solution of pancreas passed through a pulp filter until it is perfectly clear. To this clear solution is then added a saturated solution of sodium chloride and allowed to stand until the pancreatine is separated. This is carefully skimmed off and placed upon a muslin filter, and allowed to drain, after which it should be washed with a less concentrated solution of sodium chloride and then put under the press. When all the salt solution has been removed, and the mass is nearly dry, it is rubbed with a quantity of sugar of milk, and dried thoroughly without heat, after which it is diluted until ten grains emulsify two drachms of cod liver oil.

(13) B. asks how to wash flannels to prevent shrinking. A. It is almost impossible to prevent a little shrinkage of flannels in washing, unless the articles are dried on forms. Prepare hot suds beforehand, and agitate the articles in it without rubbing, then squeeze, not wring out, and dry quickly. The patent clothes wringers are an improvement upon hand labor, as without injury to the fabric they squeeze out the water so thoroughly that the article dries in considerably less time than it would do even after the most thorough hand wringing.

(14) R. M. F.—We would not be governed by a phrenological chart in forming our opinion of a young man, neither would we allow the chart to exert any influence in selecting a trade. If the young man does not know his ability and natural inclinations well enough to select a business for himself, we think he should embrace the first promising business opportunity, and do all in his power to succeed, and stick to it until he has sufficiently matured to select to determine to what business he is best adapted by nature and education.

(15) R. L. D. asks: 1. Is Swedes iron as good for electrical purposes as Norway iron? A. Yes. 2. Is No. 12 Bessemer steel fencing wire as good for a three mile line as No. 12 telegraph wire? If not, how does it compare? A. We would prefer the Bessemer steel. 3. Would the dynamo armature be better if made of Swedes iron than if made of ordinary cast iron? A. It depends on the kind of dynamo. If you refer to the small one described in the SUPPLEMENT, cast iron is as good as anything, provided it is very soft. 4. How different would the electro-magnetic machine described in No. 161 SUPPLEMENT be, if it was used to ring a polarized bell on a three mile line? A. The only difference would be that the thimble now forming the commutator should be entire, and connected with one terminal of the armature, and should be pressed by one spring only. The other terminal of the armature should be connected with the shaft, and a spring should bear against the end or side of the shaft. The current will be taken from the springs.

(16) W. S. C. asks how to fill the tube of a mercurial barometer. A. Place the tube in a very slightly inclined position with the closed end lowest, slip a piece of rubber tube over the open end, and pour in the mercury. When the tube is filled, lower the closed end and tap it very gently, to start the bubbles of air upward; finally place the tube vertically with the closed end down and let it remain for a day or so, then put your finger tightly over the open end, invert the tube, and place the open end in the cistern. In the best barometers the mercury is boiled in the bulb to drive out the air and moisture, but the above plan is simpler, safer, and answers very well.

(17) A. W. P. asks: What is used to blacken the graduating lines on boxwood rules? A. Asphaltum varnish is rubbed into the lines, and when perfectly dry is sandpapered off from the surface of the wood, leaving the black in the lines. This is not affected by the shellac varnish which is applied subsequently.

(18) C. H. C. asks the proper way to set a tool to cut threads on a regular taper tap. A. If cutting the threads with a chaser of several threads, the practice is to set the chaser so that all the teeth will cut. If with a single point, the best practice is to set the point so that both sides of the thread shall have the same angle with the center line of the tap.

(19) E. S.—Plaster of Paris is not suitable for moulds for brass. Any fine sand, such as quicksand wet with water containing a little clay, can be made a fair moulding sand. Use as little clay and water as will just make the sand hold together when squeezed in the hand.

(20) W. A. B. asks: 1. What is the best means of keeping a rest pin in piano from jumping, or not holding the string in tune? A. Try wetting it with turpentine. If this does not work, use larger pins. 2. A good cement or glue for fastening on felt, etc., to the action? A. There is nothing better than first class white glue. 3. A preparation for polishing the case? A. You do not state whether your piano case has been varnished and polished. If it has been once finished, you can give it a very good surface by rubbing it with a polish formed of equal parts of rather thick alcoholic shellac varnish and linseed oil, keeping up the rubbing until the desired polish is secured. In view of the skill necessary to use this polish successfully, we advise a trial on something else before applying it to the piano. 4. The reason a piano will not keep in tune, and remedy therefor? A. Either bad construction, unfavorable climate, or bad usage, or all combined. We could not suggest a remedy without knowing the cause. 5. The most scientific method of tuning a piano? A. Consult works on pianos or experts in these matters.

(21) W. C. F. writes: I have an immense pair of elk horns shipped to me from Colorado; they have been exposed to the weather for quite a while, and consequently are bleached quite white. Would like to know if their appearance would be improved by the application of some kind of a brown varnish; if so, what kind? A. Soak the horns for twelve hours in a solution of manganese sulphate, then wash with sodium carbonate, and on allowing to dry the color will change into the brown shade desired.

(22) A. L. P. asks: What is the best way to clean a bottle having contained a fatty substance? A. Alcohol will probably do it. Warm alcohol is better still, and ether or chloroform will dissolve most fats. Coal tar benzol or naphtha can also be used.

(23) J. T. asks how to compound a good indelible ink for marking towels, by means of brush and stencils. A. Printing ink sinks into woven fabrics to a considerable depth, and will last a long time. It is probably the cheapest marking ink that can be used with a stencil. Recipes for indelible stamping inks are given in SCIENTIFIC AMERICAN for December 13, 1884, and also in answer to query 3, in the SCIENTIFIC AMERICAN of November 24, 1884.

(24) P. J. S. asks how the black lacquer is put on opera and field glasses, and what kind of lacquer is it? A. Make a strong solution of nitrate of silver in one dish, and of nitrate of copper in another. Mix the two together, and plunge the brass into it. Now heat the brass evenly till the required degree of dead blackness is obtained.

(25) H. M. Q.—Water always runs down hill, and the Mississippi also runs down hill. The level in all parts of the earth is determined by gravity, and so accepted in all engineering work. The physical center of the earth only coincides with the plumb line on a belt around the earth at the equator, a zonal line in mid-latitude on each hemisphere, and at the poles.

(26) W. H. G. S. desires a good recipe for making pickle to keep beef, tongues, and pork. A. To each gallon of water add 1½ pounds salt, ½ pound sugar, ½ ounce saltpeter, and ½ ounce potash. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then throw it into a tub to cool, and when cold pour it over the beef or meat to remain the usual time, say 4 or 5 weeks. The meat must be well covered with pickle, and should not be put down for at least 2 days after killing, during which time it should be slightly sprinkled with saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always found in salt and sugar.

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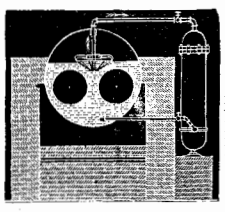

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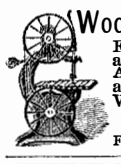

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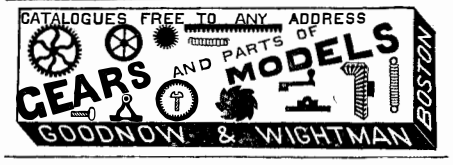

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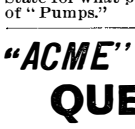

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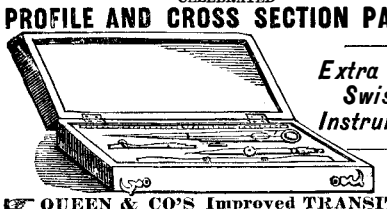

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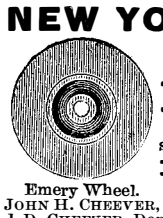

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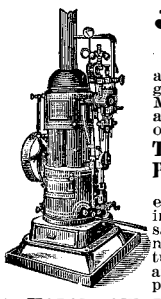

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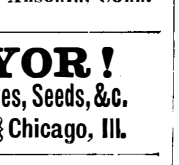

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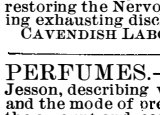

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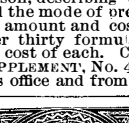

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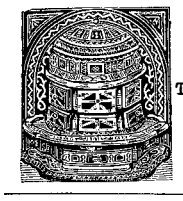

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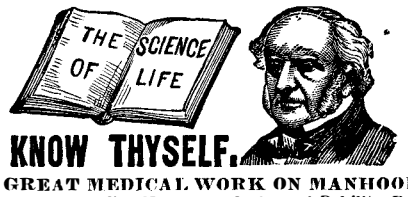

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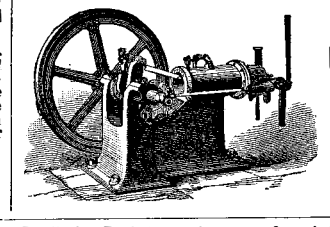

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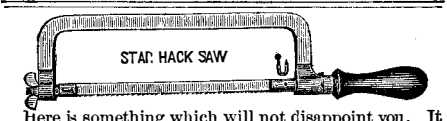

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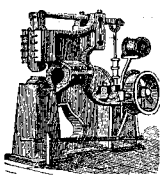

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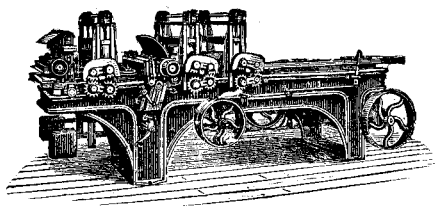

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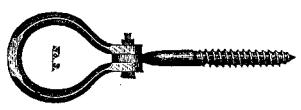

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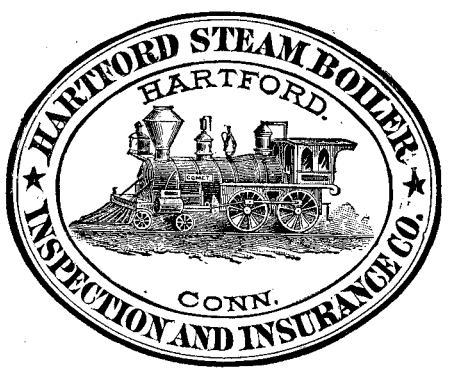

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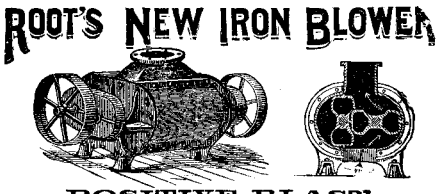

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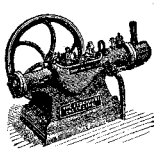

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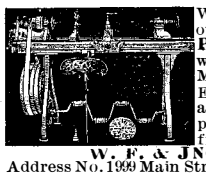

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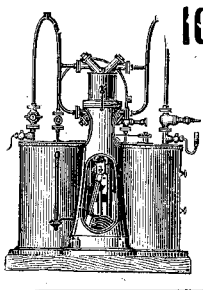

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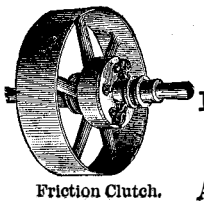
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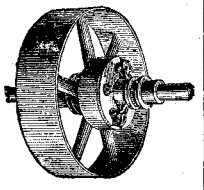
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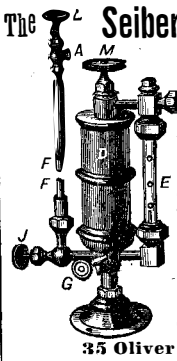

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